ATHLETIC SUCCESS AND CONTRIBUTIONS TO UNIVERSITIES' ATHLETIC DEPARTMENTS

A Thesis

by

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ABSTRACT

The economic analysis of athletic success on contributions for university athletic departments is studied through panel regression, and panel vector auto regression, along with dynamics through directed acyclical graphs, impulse response functions, and forecast error variance decompositions. Previous literature suggests a mixed picture throughout the literature in determining the effect college athletics have on contributions to universities athletic departments. The key question is what athletic variables drive contributions to the athletic department, and what their impact is.

This thesis analyzes the effect of different independent variables on the dependent variables football, basketball, other sports winning percentages and contributions through various systems based on conference alignment. These 160 universities with eight years of data are tested first through panel regression to determine error terms for the dependent variables then using these error terms through Orthogonal Partitioned Regression and Frisch-Waugh Theorems. Once these theorems have been applied, panel vector auto regression is used to provide dynamics to the study and literature.

The dynamic analysis of the results are evaluated by using directed acyclical graphs, impulse response functions, and forecast error variance decomposition provide visual evidence to support the hypothesis. The causal flows provided through the directed acyclical graphs demonstrate the impact athletics have on contributions though all systems. The impulse response functions also provide visual analysis though shocking a specific variable and determining the impact of the shock. The impulse

response functions also support the hypothesis, that increasing athletic winning percentage provide a positive impact on contributions. Forecast error variance decompositions demonstrate what percentage of the system is determined from each variable.

Economic analysis through panel regression and dynamic analysis support the hypothesis that successful athletic programs have a positive impact, and generate contributions. Further results indicate through all systems, football, basketball and other sports winning percentage cause contributions and conference alignment has a significant impact on contributions. This information is beneficial to athletic departments to aid in decision making in determining what drives contributions.

DEDICATION

I would like to dedicate this thesis to my colleagues, family and friends, who have all supported me on this wonderful, and knowledgeable journey.

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First, I would like to thank my committee chair, Dr. Mjelde and my committee members, Dr. Bessler, and Dr. Flagg, for their guidance and support throughout the course of this research. Their guidance, knowledge, innovation and support has been a true blessing and opened doors to endless possibilities. This study would not be possible without your help. The timely responses, patience and passion which was brought through numerous questions, discussions, and corrections is second to none. Their attitude and effort has set an example for not only academic but for life itself. It truly has been a pleasure to learn and work with you all, every word in an acknowledgement, would not give enough credit to the impact which you all have had.

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NOMENCLATURE

DAGs	Directed Acyclical Graphs
IRFs	Impulse Response Functions
NCAA	National Collegiate Athletic Association
SPGM	Services Philanthropic Giving Model
ISM	Identity-Salience Model
VSE	Voluntary Support of Education
FCS	Football Championship Subdivision
FBS	Football Bowl Subdivision
IND	Independent
ACC	Atlantic Coast Conference
Big 10	Big Ten Conference
Big 12	Big Twelve Conference
Big East	Big East Conference
CUSA	Conference USA
MAC	Mid-American Conference
MWC	Mountain West Conference
PAC 10/12	Pacific Athletic Conference
SEC	Southeastern Conference
SunBelt	Sunbelt Conference
WAC	Western Athletic Conference

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CHAPTER I

INTRODUCTION AND OBJECTIVE

Organized intercollegiate events began in 1852 when the rowing teams of Yale and Harvard competed at Lake Winnipesaukee, New Hampshire (Lewis 1970). This event paved the way for the creation of intercollegiate sports clubs and organizations throughout the nation. In 1869, the Scarlet Knights of Rutgers met the Princeton Tigers on the football field, marking the first college football game (Ours 1999). From these meager beginnings, intercollegiate athletics has been transformed into a vital role in revenue generation for universities. Over time contributions per athletic department have increased from an average of $116,000 in 1968-69 to $437,000 in 1981-82 (Coughlin and Erekson 1984) to $5,075,720 in 2004 to 2011 (Berkowitz, S., Schnaars, C. Upton, J 2012). Donations are playing a more vital role today than ever before.

Sigelman and Bookheimer (1983) conclude a one-unit increase in their football success score is associated with an increased in contributions of $1,251,600. Baade and Sundberg (1996a) state that between 1985 and 1992 alumni giving increased over 75%, representing more than 27% of total contributions to higher education. There are also negative effects associated with poor judgment by coaches and staff seen in donations. As an example, consider Southern Methodist University, between the years of 1982 and 1986, SMU was a national football power, their endowment increased in market value by 156%. When the NCAA placed the death penalty on SMU, SMU felt a $31 million dollar reduction in giving (Goff 2000).

University athletic programs use profit-generating sports such as football and men's basketball to provide funding for sports that do not generate profits, such as baseball, softball, track and field, and women's soccer and basketball (Burk and Plumly 2003). Coughlin and Erekson (1984) suggest that gate revenues from football may not be sufficient to support all athletic programs. Athletic departments also rely on other revenue categories including student fees, guarantees, donations, government support, institutional support, NCAA and conference distributions, media rights, concessions, advertisements and sponsorships, and endowments and investments to keep programs operating (Grant, Leadley, and Zygmont 2008). Donations to athletic departments are used to maintain and improve facilities, provide funds for travel and equipment, recruit prospective players, fund salaries, construction of buildings, research labs, and athletic facilities to entice recruits and prospective students to enroll at the university (Grant, Leadley, and Zygmont 2008). Grant, Leadley, and Zygmont (2008) call the competition for donations, the athletic arms race. It has been argued that athletic fundraising captures donations that would have otherwise accrue to the academic endowments of the school (McCormick and Tinsley 1990). If true, athletic and academic departments directly compete for limited donations. There, however, may be a positive relationship between athletic prowess and academic donations as well (Coughlin and Erekson 1984).

Objective

The objective of this study is to analyze the dynamic relationships between donations to public universities athletic departments and various athletic characteristics such as the winning percentages for the major sports, football, and basketball, along with other athletic success. Other athletic success is comprised of nonrevenue producing sports such as women's basketball, men's and women's volleyball, lacrosse, hockey along with others. To achieve this objective, data from public universities from various conferences and divisions throughout the nation are analyzed. This study includes most sports supported by the NCAA. Total athletic success is investigated by developing an all sports achievement index by combining all sports winning percentage along with what most studies consider the major sports, football and basketball. Besides the winning percentage index, selection to a bowl game, winning a bowl game, and if the team makes it to NCAA basketball tournament are included. Other exogenous variables such as gross domestic product, distance to the nearest major city, coaches' salaries, media right licensing, per seat donation tiers, athletic conference affiliation, and enrollment are included. This study uses a combination of panel regression and panel vector auto regression (PVAR) to estimate dynamic relationships between the variables. The most important reason why VAR models are used is their ability to capture long-run and short-run information in the data (Juselius 2006). To understand the dynamics of relationships, impulse responses, and forecast error variance decompositions are presented. To the author's knowledge, no previous study has used the PVAR methodology in the present context. As such, dynamics of the athletic success and donations have not been presented before.

CHAPTER II

LITERATURE REVIEW

During the 1970's, studies began looking into the effects of college athletics and their impact on universities donations. Athletic departments have become increasing dependent on contributions and financial gifts (Coughlin and Erekson 1984). Because of this increasing dependence and importance, numerous studies attempted to provide information on how donations are related to college athletic success. These studies have considered over 100 different variables (including variations of a variable). A summary of these studies addressing the effects of collegiate sports and donations is provided in tables 1 through 3. Information contained in table 1 includes year of the study, objectives, and findings of the study. A list of variables included in previous studies is provided in table 2. A numerical value is assigned to each variable in table 2 to limit the size of table 3. Included in table 3 are the variables included in each study, years considered, number of observations, and which variables had statistically significant positive or negative effects.

Results from the literature paint a mixed picture. Sigelman and Carter's (1979) review of literature found little evidence linking on field performance to alumni donations, "What we have is a wealth of speculation and a lack of conclusive evidence concerning the impact of athletic success on alumni giving" (Sigelman and Carter 1979, p. 287).

To provide additional insights into the wealth of information contained in previous studies, consider the following examples. Some studies have looked at the effects of alumni donations attributed to athletic success (Grimes and Chressanthis 1994; Baade and Sundberg 1996a); whereas, other studies analyze the effects athletics have on both alumni and non-alumni donations (Stinson and Howard 2004; Humphreys and Mondello 2007). Grimes and Chressanthis (1994), along with Stinson and Howard (2004), examine only public schools, while Rhoads and Gerking (2000) and Humphreys and Mondello (2007) include both public and private schools. Still other studies have examined the effects at a single university (McCormick and Tinsley 1990, and Stinson and Howard 2004), while most studies include multiple universities (Baade and Sundberg 1996a; Tucker 2004; Stinson and Howard 2007; Humphreys and Mondello 2007).

As previously noted, previous studies' conclusions provide mixed results. Sigelman and Bookheimer (1983), Gaski and Etzel (1984), McCormick and Tinsley (1990), McEvoy (2005), Stinson and Howard (2008), and Martinez et al. (2010), for example, find athletic success has a positive impact on athletic donations. Whereas, Budig (1976), Turner, Meserve, and Bowen (2001), and Litan, Orszag, and Orszag (2003) found no statistical evidence relating athletic success to donations. Building off the work of Frank (2004) and Goff (2000), Humphreys and Mondello (2007) find athletic success can lead to increased donations; however, these effects are small. Brooker and Klastorin (1981) and McCormick and Tinsley (1990), along with Stinson and Howard (2008), find athletic success not only leads to increases in athletic donations, but also positively impacts academics donations.

Abundant measures have been used to measure athletic success. The majority of studies include football when analyzing the effects of donations related to athletic success. Football success appears to display a much stronger influence on donations than basketball or any other sport (Baade and Sundberg 1996a; Goff 2000; Humphreys and Mondello 2007; McCormick and Tinsley 1990; Rhodes and Gerking 2000; Stinson and Howard 2007). In fact, some studies have looked specifically at football records (Amdur 1971; Turner, Meserve, and Bowen 2001; Litan, Orszag, and Orszag 2003). Basketball records have been included by studies such as Budig (1976), Sigelman and Carter (1979), and Tucker (2004). Mixed results for basketball are found, adding to the confusing picture. Sigelman and Carter (1979), Brooker and Klastorin (1981), Sigelman and Bookheimer (1983), Coughlin and Erekson, (1984), Grimes and Chressanthis (1994), Baade and Sundberg (1996a), Rhoads and Gerking (2000), Goff (2000), Tucker (2004), Stinson and Howard (2008), and Koo and Dittmore (2014) all include basketball success. Only Brooker and Klastorin (1981), Sigelman and Bookheimer (1983), Grimes and Chressanthis (1994), and Stinson and Howard (2008) find basketball success to have a statistical significant positive effect on donations.

Researchers have also included post-season play in their models (Sigelman and Carter 1979; Coughlin and Erekson 1994; Baade and Sundberg 1996a; Stinson and Howard 2007). In 2004, there were 56 teams invited to compete in 28 different bowl games, whereas, in 2012 there were 70 teams competing (College Football Poll 2004-

2005; College Football Poll 2011-2012). The NCAA basketball tournament increased its number of teams from 65 in 2004 and to 68 teams 2011 (Associated Press 2010). With the increases in size of both basketball and football post season play, more teams can potentially be feeling the effects of post-season success. Sigelman and Carter (1979) and Goff (2000) look specifically at football post season play, while Coughlin and Erekson (1984), Grimes and Chressanthis (1994), Baade and Sundberg (1996a) (at doctorate institutions), Rhoads and Gerking (2000), and Tucker (2004) analyze the effects of both appearances in bowl games and NCAA tournament bids. Results suggest there is more of an effect on donations for attending a bowl game, than there is for accepting a bid to the NCAA basketball tournament.

Studies such as Grimes and Chressanthis (1994) and Rhoads and Gerking (2000) added baseball wins and losses, along with post-season play for football, basketball and baseball, and athletic sanctions or probation. Results for baseball suggest baseball has no significant impact on contributions. Both Grimes and Chressanthis (1994) and Rhoads and Gerking (2000) found sanctions to decrease donations received by universities. Surprisingly, there have only been two studies, in my review of literature, looking into the effects of NCAA probation or sanctions on donations; both studies found significance decreases in donations related to the sanctions.

Sigelman and Bookheimer (1983) suggest there is competition between college donations and attending professional sporting events. Other studies have shown positive correlations between the overall improvements in economic conditions and donations (Brooker and Klastorin 1981; Coughlin and Erekson 1984; Grimes and Chressanthis

1994; Murphy and Trandel 1994; Stinson and Howard 2007; Humphreys and Mondello 2007; Koo and Dittmore 2014).

Research has also shown that athletic success may elevate student awareness by high school students resulting in increased applications (Murphy and Trandel 1994). Increases in enrollment and elevated SAT scores of incoming students has been found to be related to athletic success (Coughlin and Erekson 1984; Tucker and Amato 1993; Mixon 1995; Rhodes and Gerking 2000). Changes in enrollment at a university have been seen as an indirect benefit of having a successful athletic program.

CHAPTER III

THEORY, METHODOLOGY, AND DATA

Theoretical Background

Stinson and Howard (2007) reference two previously developed conceptual models, which attempt to explain charitable giving to universities, the services-philanthropic giving model (SPGM) (Brady et al. 2002) and the identity-salience model (ISM) (Arnett, German, and Hunt 2003). The SPGM (figure 1), which is found in the charitable-giving and services-marketing literature, is based on the idea that donors receive value or satisfaction from forming intents to give. Greater levels of satisfaction, service quality, and value are related to larger intents to give (Brady et al. 2002). This value judgment or decision to contribute is essentially a cost-benefit analysis in which the donor considers the economic sacrifices made in relation to satisfaction received (Stinson and Howard 2007; Bitner and Hubbert 1994; Rust and Oliver 1994). Satisfaction or benefits received by the donor may be athletic specific or personal; however, the satisfaction or benefits are derived through individual interactions and experiences with the program or organization (Brady et al. 2002).

The SPGM proposes that organizational identification or connections to the athletic department or teams influence the intent to give through an emotional attachment. The donor experiences the thrills of success and the agony of defeats of the athletic programs because of organizational identification (Ashforth and Mael 1989). This emotional connection donors experience maybe a significant factor why universities receive donations. The SPGM supports the belief that athletic success through winning has a significant influence on athletic giving.

Based on identity theory, the ISM (figure 2) asserts that identity salience is an important predictor of donor behavior. In this model, the donor receives a social benefit instead of an economic benefit because of a connection with the athletic department. Higher levels of participation in activities with the university create a more salient identity, which is supported and strengthened through contributing or volunteering (Stinson and Howard 2007). The ISM model includes two factors that affect donor behavior, income and a perceived need of the organization or team. Athletic gifts stem from an identity tied to the athletic department or teams. Both the SPGM and ISM suggest that athletic programs' success influence giving (Stinson and Howard 2007).

Coughlin and Erekson (1984) believe donors behave as utility-maximizing economic agents, which derive utility from giving to organizations including universities. Utility of a donor is expressed as

(1) $$U_d = U_d(X_1, X_2, \ldots, X_m, E)$$

where the utility the donor receives, U_d, is derived from consumption of private goods, X_i, m is the number of goods consumed, and E represents the value received from athletic programs. Donors not only receive utility from attending athletic games and the success of the programs, but also from other activities which they are given access to because they contributed to the athletic program. These activities include meet and greets with coaches and players, tailgates, prime seating, and opportunities to travel to with the teams. Value received from athletic programs (including access to programs) is a function of contributions, C,

(2) $$E = f(C, W_1, W_2, Y_1, Y_2, \cdots Y_k, S)$$

where contributions are a function of individual donor characteristics, Y_i, university characteristics, W_i, and athletic success, S. Donors maximize their utility subject to a budget constraint.

The athletic departments' utility is dependent on the successes of the teams on the field

(3) $$U_A = U_A(S, B),$$

(4) $$S = (Z_1,\ Z_2, \ldots Z_n).$$

where U_A represents utility of the athletic department, S represents success of the athletic teams, B is the athletic budget, and Z_i represent different inputs that contribute to the success of the athletic program. Inputs which include coaching staff, recruiting, facilities, etc. (Coughlin and Erekson 1984) are influenced by the athletic budget. As an economic agent, athletic departments maximize their utility subject to their budget constraint. Athletic departments' funds come from many sources including state funds, ticket sales, and donor contributions.

Athletic success, therefore, may be associated with contribution amounts and contribution amounts may be related to success; thus, creating a system. Further, it is reasonable to assume past activities (contributions and success) may influence current activities.

The simplest, and probably the most significant, measure of athletic success is winning percentage. Success may have different benefits for the donor than for the athletic program. Athletic programs are interested in development of student athletes on the field, gaining post-season appearances, earning conference and national titles, and building athletic facilities. While donors who enjoy experiencing athletic success as mentioned earlier, receive other benefits from contributing. These benefits of giving such as a preferred seating at the football stadium, trips to post season games, or parking privileges all which become more coveted with greater athletic success. In this context, "giving" is really a form of "consuming" and the effects of a change in athletic fortunes might be particularly evident in giving that is restricted to athletics (Turner, Meserve, and Bowen 2001).

Previous theoretical models and studies suggest a dynamic system of equations is necessary to capture the effects of exogenous variables and understand the dynamic effects athletic success has on athletic contributions. Besides contributions, winning percent, as a measure of success is included for three sports, men's football (FB%), men's basketball (BB%), combined percent for all other sports (OS%) plus exogenous variables, *Y*, W, and *Z*. The dynamic and system nature suggest a vector autoregressive model is appropriate. This model is

(5) $$Cont_{it} = f(Cont_{i\,t-1}, FB\%_{i\,t-1}, BB\%_{i\,t-1}, OS\%_{i\,t-1}, Y_1, \ldots, Y_k, W_1, \ldots, W_n, Z_1, \ldots, Z_m),$$

(6) $$FB\%_{it} = f(Cont_{i\,t-1}, FB\%_{i\,t-1}, BB\%_{i\,t-1}, OS\%_{i\,t-1}, Y_1, \ldots, Y_k, W_1, \ldots, W_n, Z_1, \ldots, Z_k),$$

(7) $$BB\%_{it} = f(Cont_{i\,t-1}, FB\%_{i\,t-1}, BB\%_{i\,t-1}, OS\%_{i\,t-1}, Y_1, \ldots, Y_k, W_1, \ldots, W_n + Z_1, \ldots, Z_k),$$

and

(8) $$OS\%_{it} = f(Cont_{i\,t-1}, FB\%_{i\,t-1}, BB\%_{i\,t-1}, OS\%_{i\,t-1}, Y_1, \ldots$$

$$, Y_k,\ W_1, \ldots, W_n,\ Z_1,\ \ldots,\ Z_k).$$

Estimation - Methodology

Estimation of the above model requires some assumptions to be able to capture the effects of exogenous variables and understand the dynamic effects of football, basketball, and other sports winning percentages on athletic contributions. Data is comprised of 160 universities over eight years, making the model a time series panel model. Panel models allow for the estimation to account for university specific effects. Unfortunately, to the author's knowledge, a statistical package that estimates such a panel vector autoregressive model (PVAR) with exogenous variables directly is not available. The development of such an algorithm is beyond the scope of this study. To overcome this limitation, a two-step procedure is use based on Orthogonal Partitioned Regression and Frisch-Waugh Theorems.

The Orthogonal Partitioned Regression theorem states that in multiple linear least squares regression using two or more independent variables, if the variables are orthogonal, separate coefficient vectors can be obtained using individual regressions of the dependent variable on each independent variable separately (Greene 2002). This study assumes the variables are orthogonal; this will be discussed further in the limitations section. Applying the Frisch-Waugh theorem allows one to use only the residuals from panel estimation of the four dependent variables on the exogenous variables in a PVAR. Although the Frisch-Waugh theorem has only been proven for ordinary least squares, this study assumes it holds for generalized least squares using panel data. See Baltagi (2002) and Greene (2002) for proofs of both theorems.

The first step is to estimate individual panel equations for the four dependent variables using exogenous and lagged independent variables. A PVAR is then estimated using the residuals from each of these four equations in the second step. As a combination of the time-series vector autoregressive and panel data estimation, the PVAR has several advantages in analyzing the dynamic relationships, primarily in efficiency of the estimation. PVARs have been used in applied macroeconomics since its first introduction by Holtz-Eakin, Rosen, Newey (1988). The PVAR methodology is particularly suited for this study because, PVARs are able to capture dynamic interdependencies, treat the links across units in an semi-unrestricted fashion, easily incorporate time variations in the coefficients in the variances of time, and account for cross sectional dynamic heterogeneities (Canova and Cicarelli 2013). PVAR is based on the same logic of a vector auto regressive model, but adds the cross-sectional dimension (Canova and Cicarelli 2013).

Step 1 – Panel Equation Estimation

Each of the equations, football, basketball, and other sports winning percentage, and contributions are estimated individually, assuming random effects, including exogenous variables to generate the residuals. Although theory suggests, individual characteristics of each donor influences contributions, such information is not available, as such they cannot be included in the model. Each of the four equations will contain the same variables. Containing the same variables allows each equation to be estimated individually, because estimating as a system provides no additional information. This is common in estimating VARs. The xtreg panel estimation command in STATA version 12 is used (StataCorp 2011). The panel regression model for each individual equation is

(9) $\vartheta_{it} = \rho_{it}B_1 + \ldots + \rho_{ik}B_K + u_i + \varepsilon_{it}; i = 1, \ldots 160, t = 2004, \ldots 2011,$

(10) $\vartheta_{it} = \rho'_{it}B + (\alpha + u_i) + \varepsilon_{it}$

ϑ_{it} is the dependent variable, $\rho_{it}B_1$is a K-dimensional row vector of exogenous variables, u_i is an individual specific effect, and $\varepsilon_{it}$is an idiosyncratic error term. Random effects specify that u_i is a group specific random element, similar to ε_{it} except that for each group there is but a single draw that enters the regression identically in each period (Greene 2002). Generalized least squares method is used within xtreg to estimate the panel models.

As previously noted, an equation is individually estimated for each of the dependent variables in the system: contributions, football winning percentage, basketball winning percentage, and other sports winning percentage. Exogenous variables included in each equation are:

Bowl - football bowl game appearance lagged one year;
Bwin - football bowl win lagged one year;
NCAA - NCAA basketball tournament appearance lagged one year;
Student - student enrollment;
Right licensing - the total amount of money the university receives for media rights;
Salary - total coaches' salaries;
GDP - US gross domestic product;
Distance – miles from campus to the nearest city where the population exceeds 200,000;
Football conference alignment (ACC, Big 10, Big 12, Big East, CUSA, MAC, MWC PAC 10/12 SEC, Sun Belt, and WAC conferences of FCS, and IND are used as the base);
Ticket donation tiers (No donation to $500-tier 1 used as the base, $500 to

$2000-tier 2, and tier 3, $2000 and above.

A discussion of the variables is found in the data section.

Step 2 – Panel VAR Estimation

Error terms are generated for each observation by equation from step one by combining the individual specific effect $u_i$and the idiosyncratic error term, ε_{it}. This error term is then used to estimate the PVAR. The PVAR is:

(11) $$\alpha_{it} = \Gamma_1 \alpha_{i,t-1} + \epsilon_{it} \,; i = 1, \dots 800.$$

Where the vector α_{it} is,

(12) $$(FBResidual_{i,t-1}, BBResidual_{i,t-1},$$
$$OtherResidual_{i,t-1}, ContResidual_{i,t-1}),$$

for university *i*, in year *t*, Γ_1, are a matrix of coefficients to be estimated, and, ϵ_{it} is the vector of error terms. FB, BB, Other, and Cont refer to the residuals from the football, basketball, other sports winning percentage equations, and contributions equation. The PVAR is estimated through generalized methods of movement that is a heteroskedastic autoregressive consistent estimator of unknown parameters. The PVAR procedure was developed by Love and Ziccino (2006) and implemented within STATA. With only eight years of data, the number of lags is assumed to be one in the PVAR.

Post-Estimation - Dynamic Analysis

To understand the contemporaneous relationships between the four dependent variables, directed acyclical graphs (DAG) will be used. DAGs are a way of summarizing the contemporaneous causal flow (Olsen 2010). Directed graph techniques represent a recent advancement in causality analysis (Rettenmaier and Wang 2012).

Once the covariance matrix has been produced for the error terms from the PVAR, DAGs will be used to help understand the causal relationship of the error terms. The PC technique within TETRAD (2004) is used to estimate the DAG from the nonorthogonal innovations covariance matrix. A DAG is an illustration using arrows and vertices to represent the casual flow among a set of variables, specifically the error terms from the PVAR. Arrows are used to represent causal flows, if there are no arrows connecting variables then there is no causal structure between the two variables. An arrow connecting two variables, X→Y indicates that variable X causes variable Y. A line connecting two variables, W — X, indicates that W and X are connected by information flows, but the algorithm cannot determine if W causes X or vice versa (Olsen 2010). Details of DAGs can be found in Pearl (2000) and Spirtes, Glmour, and Scheines (2000).

Dynamics between the four endogenous variables are examined through impulse response functions. An impulse response function is a measure of the time profile of the effect of a shock on the behavior of a series (Koop, Pesaran, and Potter 1996). This study analyzes the response to each of the dependent variables to a shock in each of the other dependent variables. Impulse response functions provide a visual measure of size and direction of responses. PVAR uses a Cholesky decomposition to ensure the residuals from the PVAR are orthogonal. Unfortunately, the Cholesky decomposition depends on the order of the series. The order of the series will be based on the DAGs.

Forecast error variance decompositions are used to determine in the system where information arises over time. The following discussion is based on Olsen, Mjelde, and Bessler (2014). Endogenous variables receive most of their information from other variables series within the system. A series whose information is dominated by its own series are considered exogenous. A "perfectly endogenous" series would see all of its forecast error variance is explained by information arising from other series. If four variables, for example, are included in the system, the decompositions for a "perfectly endogenous" variable would be 0% for the perfectly endogenous market and 100% (combined) for the other three variables. On the other extreme, if one of the four variables is "perfectly exogenous" its own decomposition would be 100%, whereas, decompositions for the remaining variables would be 0%.

Data

Data from 160 public universities' athletic departments in the United States are used in the study (Berkowitz, S., Schnaars, C. Upton, J 2012). Variables available from USA Today are total revenue of the athletic department and ticket revenue, contributions, along with right licensing, scholarships, coaches' salaries, and expenses (table 4). For this study, however, only contributions, coaches' salaries, and right licensing are used from the comprehensive USA Today study. This dataset covers the years 2004 to 2011. Only public schools are included in the analysis due to the access of public information. Further to be included, data for the school had to be complete, meaning all data are available for every year.

The Voluntary Support of Education (VSE) database is used to obtain school student enrollments and to validate the USA Today donation information (Council for Aid to Education 2014). On field performance measures, wins and losses are included in the analysis. As previously noted, there are four dependent variables, contributions, football winning percentage, basketball winning percentage, and other sports winning percentage. The four different equations are composed of the same exogenous variables. Inclusion of men's major sports is consistent with previous studies. Data for the major sports come from the NCAA (NCAA Archives 2014). Each of the exogenous variables previously listed are discussed.

Post-season success may be a vital instrument in recruiting athletes and gaining contributions. One way to measure success is achievement of post-season play in football by reaching a bowl game, not including the FCS playoffs. Lagging the bowl game is an important variable to include because the effect and momentum it has on the football program. In 2014, over 30 bowl games were televised, helping advertise both the university and their athletic programs. Coughlin and Erekson (1984) found that participating in a bowl game increases donations; this study will take this further by including not only bowl game participation but also the game's outcome. There is no question of the importance of bowl games to the athletic program and to the university that exists because of reaching bowl eligibility and gaining national media exposure. Testing to see if winning a bowl game is more significant than just accomplishing a six to seven win achievement appears to be essential. Recruits and alumni, seeing their team on the field and having success could impact contributions along with football winning percentage. Both bowl game appearance and winning the game will enter the model as 0-1 qualitative variables.

Lagged NCAA basketball tournament appearance, similar to football bowl games, is important to determine the success of the basketball program and is included as a 0-1 qualitative variable. Incorporating the NCAA tournament appearance lagged one year is used to help determine the success of the basketball program. Like football NCAA appearances help attract recruits to basketball programs, which have seen success, and to help attain future success. This success may be an important variable in determining winning percentage for basketball, along with contributions.

Enrollment, listed in thousands, serves as a proxy for the size of the university, therefore, its alumni base. Enrollment has been a significant variable in many studies therefore, it is included. This data was collected from the VSE database (Council for Aid to Education 2014).

Media right licensing, (Berkowitz, S., Schnaars, C. Upton, J 2012) listed in thousands dollars, is included to help understand the effect of what is paid to the university to televise their teams. Previous studies have shown that it is important to not only play games on television, but to win games, which are televised. Adding this variable is a proxy for all games played on TV, and the potential benefit to contributions and helping recruit to athletic programs because of national exposure.

Coaches' salaries, (Berkowitz, S., Schnaars, C. Upton, J 2012) in thousands, may be important in determining if teams have on field success. Universities deliver major salaries to coaches who are proven winners or who have turned a program around and gained recent athletic success. One expects the higher the total salary for all coaches employed the more successful the athletic programs.

The ability to understand the influence the economy has on donations is examined by including U.S. gross domestic product (GDP). If the economy is doing well, is there an increase in contributions because donors have more money to give? GDP data is listed in nominal terms, and in billions, and provided from the (U.S. Bureau of Economic Analysis 2014).

Distance is essential to understanding if there is potential competition for donors' funds between available sporting events. Distance is collected from Google maps (Google Maps 2014). Sigelman and Bookheimer (1983) and McCormick and Tinsley (1990) included this as an only game in town factor to see if there is competition to attend other venues such as professional sporting events and not contribute to the university.

Over the last few years, many universities have been jumping ship from one conference to another to gain athletic or academic prestige, increase in funds, along with other benefits. Understanding the impact conference alignment has on the four dependent variables may help explain why universities are "conference hopping." Conference alignment is included as a 0-1 qualitative variable based on the conference the football team participates in for the years 2004 and 2011. For some schools conference alignment will vary by year. Only one school was an independent, Army, therefore, they were included in the FCS/IND category, which is used as the base. Conference alignment is taken from (NCAA Archives 2014).

Many athletic departments require donations to be able to purchase or maintain seats in the football stadium. The donation is charged per seat for a season ticket on top of the ticket price. The ticket donation for all 160 schools is been broken into a tiered system: no donation to \$500, \$500 to \$2,000 donation per seat, and over \$2,000. The first tier is used as the base. Variables are assigned a 0 or 1 depending on which tier the university uses for the year 2014 season. This data was obtained through phone calls to each universities athletic department ticket office or the universities' website.

Other studies have looked at NCAA sanctions; however, only 8 of the 1,280 observations (school and year) encompass sanctions; therefore, sanctions are not included in the model. Sanctions or penalties placed on athletic programs are obtained from the NCAA Archives (2014).

CHAPTER IV

RESULTS

Besides the full system presented in the methodology section based on all conferences, systems based on the major and minor conferences are presented. The major and minor conferences systems are based on the idea that there may be differences in donations between universities between the major and minor football conferences that are not captured in the all conferences system. For all systems, estimation results from the individual dynamic panel equations are presented. A significance level or alpha value of 5% is generally assumed. After the individual panel equations are discussed, the PVAR results are examined along with DAGs, impulse response functions, and forecast error variance decompositions.

All Conferences System

Panel Estimation

The overall R^2 for the contributions model is 0.57 (table 5). Significant variables at the 5% level are lagged bowl games, coaching staff salaries, ACC, Big 10, Big 12, Pac 10/12, and SEC conferences. Attending a bowl game increases contributions by approximately \$1.5 million. Positive significance of a bowl game aligns with Tucker and Amato (1993), Rhodes and Gerking (2000), Tucker (2004), and Humphreys and Mondello (2007), but disagrees with Sigelman and Carter (1979). For every \$1,000 dollar increase in total coaching staff salaries there is a \$561 increase in contributions. The major conferences are significantly different than the base of FCS/IND. The Big

12, for example, brings in contributions of \$11.7 million more than the base of FCS/IND schools while the SEC delivers \$11.4 million more on average for universities associated with this conference. The Big 10 follows with an increase in contributions by \$5.9 million, then the PAC 10/12 with \$5.8 million, and finally the ACC with \$5.8 million.

Lagged NCAA tournament appearance is significant at the 11% level. Appearing in the NCAA tournament increases athletic donations by approximately \$888,000. This finding is similar to results in Mixon (1995), Rhodes and Gerking (2000), and Humphreys and Mondello (2007). Combining the outcome of post-season play for both football and basketball affirms Rhodes and Gerking (2000) findings that the effect of a bowl appearance is larger than that for a NCAA tournament appearance. Variables that have counterintuitive signs based on a priori expectations but are insignificant are winning the bowl game, enrollment, and the MAC conference.

Pairwise differences in conference alignment coefficients are tested using F-tests (table 6). Conference alignment appears to create three levels of contributions based on significant differences between the conferences and magnitude of the estimated coefficients. The Big 12 and SEC generate the largest levels of contributions followed by the Big 10, ACC, Pac 10/12, and then the remaining conferences.

The model for football winning percentage has a R^2 of 0.17 (table 7). Significant variables at 5% level in the model are lagged football bowl game, distance from a major city, and the Sun Belt conference. Appearing in a bowl game in the previous year increases your football winning percentage by six to seven percentage points (note models were estimated with winning percent in decimals). For every mile away from a major city, football winning percentage increases by 0.0004 percentage points. Therefore, for every hundred miles farther away from a major city with the population of 200,000 or larger, football win percentage increases by four percentage points. The Sun Belt is the only conference which is significant; universities aligned with this conference have an average decrease in football win percentage of 12 percentage points over the base conferences.

The ACC, Big 10, MAC, MWC, and PAC 10/12 conferences become significant at the 15% level. Coefficients on all conferences are negative indicating winning percentages are decreased relative to the schools in the base of FCS/IND schools. One reason for the low significance level of conference alignment and winning percentage is that within a conference the winning percent must be 50%. Tier 3 variable is significant at the 10% level; schools charging a larger donation for tickets have an average increase in winning percentage of four percentage points.

The basketball winning percentage model (table 8) has an R^2 of 0.20. Significant variables are: lagged NCAA tournament, ACC, Big 12, CUSA, and MWC. Appearance in the NCAA tournament increases basketball winning percentage by six percentage points the following season over not being selected for the tournament. Alignments with the ACC, Big 12, CUSA, and MWC increase basketball winning percentage over the base FCS/IND conferences. Schools in the ACC on average have an increase winning percentage of nine percentage points over FCS/IND schools, while schools in the Big 12 have approximately an eight percentage points higher winning percentage. Alignment with the CUSA brings a 12% increase in winning percentage points over the base.

MWC schools on average have a basketball winning that is eight percentage points larger than the base.

At the 15% level, the Big East, PAC 10/12, WAC, and tier 2 become significant. The Big East, a typical powerhouse conference doesn't become significant until 13% and increases winning percentage by six percentage points. Football conference alignment is used for conference alignment and many schools which participate in the Big East for basketball are not aligned in this conference for football, this maybe the reason why the Big East conference is not significant at lower levels. The PAC 10/12 becomes significant at11% while the WAC is significant at 12%. Schools in both conferences have a five to six percentage point larger winning percentage. Tier 2 level of ticket donations for football season tickets decreases basketball winning percentage by three percentage points. The insignificant (or high levels) of conference alignment in explaining basketball winning percentage is similar to that of football that within a conference the winning percentage has to be 50% and the majority of games are played in conference.

The others sports winning percentage estimation (table 9) has an overall R^2 of 0.36. Variables that are significant at the 5% level are: enrollment, ACC, Big 12, and SEC. Enrollment influences other sports winning percentage positively increases the winning percentage by 0.0016 percentage points for every 1,000 students. Association with the ACC, Big 12, or SEC football conference increases universities other sports winning percentage compared to the FCS/IND base. The largest magnitude difference from the conference base is the ACC with an eight percentage point increase in other sports winning percentage. Following the ACC are the Big 12 and SEC with schools having a six percentage point increase over the base

Variables that become significant at the 15% level are MWC, coaches' salaries, and tier 3 ticket donations. MWC conference affiliation has a positive effect on other sports winning percentage, increasing it by five percentage points, which is significant at six percent. Coaches' salaries is significant at the 6% level and increase winning percentage points by 0.0000017 for every $1,000 dollars paid in total coaches' salaries. Tier 3 ticket donations are significant at the nine percent level and increase other sports winning percentage by two percentage points.

PVAR

As explained in detail in the methodology section, the residuals from the independent panel estimations are used to estimate a PVAR with one lag. Because estimated coefficients from PVAR's are difficult to interpret, contemporaneous causal relationships and impulse response functions are presented from the PVAR.

Contemporaneous Causal Relationships

Directed acyclical graph (DAG) from using the residuals of the PVAR are presented in figure 3, for the all conferences system. The DAG is based on assuming a 0.01 significance level and a multinomial distribution. In contemporaneous time, football winning percentages provides information to (cause) basketball winning percentage and contributions. Contemporaneous information flows provide evidence supporting the hypothesis that football winning percentage impacts contributions to the athletic department. Basketball winning percentage and contributions are connected by information flows; however, the algorithm could not determine the direction of the flow. Other sports winning percentage causes contributions; this provides information supporting the belief that total athletic success impacts contributions. A causal relationships exists going from other sports winning percentage to basketball winning percentage.

The DAG in figure 3 supports the hypothesis that athletic success has an impact on contributions. Football and other sports winning percentages are shown to be prime movers, having multiple causal relationships. Basketball winning percentage shows to be effected by both football and other sports winning percentage. There appears to be spillover effects between athletic successes in different sports at a university.

Impulse Response Functions

Dynamic relationships among contributions and sports success is examined through impulse response functions. The PVAR algorithm uses a Cholesky decomposition to make the residuals from the PVAR independent before generating impulse response functions. Unfortunately, the Cholesky decomposition depends on the order of the series. The order of the series of football, other sports, basketball winning percentage, and contributions is used to generate the impulse response functions. To examine potential differences, impulse response function for a second ordering, football, basketball, other sports, and contributions are also presented.

The impulse response functions for the all conferences system using the ordering of football, other sports, basketball winning percentage, and contributions are given in figure 4 and from figure A.1 (additional detail).Shocking football winning percentage increases both basketball and contributions. Contributions respond immediately to the shock in football winning percentage while it takes a season to see the response in basketball winning percentage. Other sports respond negatively to a shock in football winning percentage.

Shocking other sports decreases football and basketball winning percentages, along with contributions. Football and basketball both begin to see a negative effect after the first year with a shock to other sports winning percentage. Contributions respond negatively to an increase in other sports winning percentage and continue to decrease for the years presented.

Shocking basketball winning percentage provides a positive impact on football winning percentage which increases slowly for the remainder of the years presented. Other sports respond slightly negatively to a shock in basketball winning percentage. Contributions respond immediately with a positive reaction to a shock in basketball winning percentage and increase steadily after year one.

By shocking contributions there is an increase in both football and basketball winning percentage. There, however, is a negative impact for other sports by shocking contributions. Basketball initially feels the shock of contributions, decreases in year one, and then increases for the remainder of the years presented.

Impulse response functions for the second ordering of football, basketball, other sports, and contributions are presented in figures 5 and in figure A.2. Shocking football winning percentage increases both basketball and contributions. Contributions respond immediately to the shock in football winning percentage while it takes a season to see the response in basketball winning percentage. Other sports respond negatively to a shock in football winning percentage. Providing a shock to basketball winning percentage causes football winning percentage to increase slowly over the years presented. Other sports respond negatively to a shock in basketball winning percentage. Contributions show an initial positive response, then increase after year one to a shock in basketball winning percentage.

Shocking other sports decreases football and basketball winning percentages, along with contributions. Football and basketball both begin to see a negative effect after the first year. Contributions respond negatively to an increase in other sports winning percentage and continue to decrease for years presented.

By shocking contributions there is an increase in both football and basketball winning percentages. There, however, is a negative impact for other sports by shocking contributions. The impact of shocking contributions has a steeper incline for football than basketball.

Impulse response functions from both orderings affirm the belief that football and basketball are drivers of contributions. These results affirm the beliefs of Baade and Sundberg 1996a; Goff 2000; Humphreys and Mondello 2007; McCormick and Tinsley 1990; Rhodes and Gerking 2000; Stinson and Howard 2007 for footballs impact on contributions, and Brooker and Klastorin (1981), Sigelman and Bookheimer (1983), Grimes and Chressanthis (1994), and Stinson and Howard (2008) for basketball impact on contributions. Athletic success in sports other than football and basketball seem to diminish athletic contributions.

Forecast Error Variance Decompositions

Forecast error variance decompositions provide the percent of variation for each series at a specific time due to innovations in each series. The all conferences system's forecast error variance decompositions for the ordering of football, other sports, basketball, and contributions are presented in table 10, whereas, the decompositions for the second ordering of football, basketball, other sports, and contributions, and basketball are given in table 11. Decompositions for the system at contemporaneous time or zero, one, four, and nine years are provided. The rows for each variable provide the percent of uncertainty, or variation for each variable, football, basketball, other sports, and contributions attributed to each variable at the given horizon.

For the first ordering (table 10), football explains 100% of itself, other sports explains 100% of itself, and basketball explains from 97% percent of itself at contemporaneous time. Contributions are explained from (18%) football, two percent other sports, (29%) basketball, and (51%) from itself. In contemporaneous time for the second ordering, (table 11), football generates 100% of explanation for itself, basketball explains almost 100% of itself, and other sports explains 96% of itself. Contributions are explained by football (18%), basketball (31%), zero percent from other sports, and by itself (51%).

In year nine of the decomposition for the first ordering the percent variance of each variable explained by the variables is roughly the same. Football explains approximately seven percent of the variance in all variables, other sports 34%, basketball 21%, and contributions 38%. For the second ordering, the percent variance of each variable explained by the variables is also roughly the same. Football explains approximately seven percent of the variance in all variables, basketball explains approximately 12%, other sports 44%, and contributions 38%. Inferences from the two orderings are similar, both football and basketball have an immediate impact, however commitment to overall athletic success though other sports is essential.

Major Conferences System

A system that contains only the major athletic conferences, ACC, Big 10, Big 12, SEC, and the Pac 10/12 (base), is estimated to examine the robustness of the above results. Forty-six universities are included, giving a total of 322 observations; summary statistics are provided in table 12. Similar procedures to the all conferences system are used.

Panel Estimation

Major conferences contributions model's R^2 is 0.19 (table 13). The only significant variable at the 5% level is coaches' salaries. For every $1,000 dollar increase in total coaching staff salaries there is a $605 increase in contributions. This result is also significant in the all conferences system, however, its' affect is slightly higher in magnitude than in the all conferences system.

Bowl game attendance increases contributions by $2.9 million and is significant at the 10% level. The magnitude for a bowl games effect on contributions model in the major conferences system is two times greater than the all conferences system which has a magnitude of $1.4 million. The level of significance decreases, however, in the major conferences system. This may indicate non-major conferences contributions are more closely related to bowl appearances. None of the conferences are significantly different from the base Pac10/12 conference. Further, none of the conferences are significantly different from the other conferences (table 14). This inference is different than the inferences for conference differences in the all conferences system.

Football winning percentage for the major conferences system has an R^2 of 0.24 (table 15). Only two variables are significant at the 5% level: bowl games and coaches' salaries. Participating in a bowl game increases football winning percentage by eight percentage points the next season which is a two percent increase over the full dataset. Coaches' salaries have a positive coefficient; however, this coefficient's magnitude is minimal, providing an almost zero increase in winning percentage. No additional variables are significance at the 15% level. Distance is the only variable which is significance in the all conferences system that is not significant in the major conference system, excluding conference alignments.

Basketball winning percentage model for the major conferences system has an R^2 of 0.29 (table 16). At the five percent significance level the NCAA tournament is the only variable which impacts basketball winning percentages. Participation in the NCAA tournament increases basketball winning percentage by eight percentage points for the next year. No other variables are significant at the fifteen percent significance level.

Other sports winning percentage for the major conferences has an R^2 of 0.26 (table 17). Two variables significant at the five percent level are distance and tier 3 ticket donations. Distance negatively impacts other sports winning percentage by four percentage points for every hundred miles a university it is further away from a city with a population greater than 200,000. Tier 3 ticket donations increase other sports winning percentage by six percentage points.

At the 15 percent significance level, coaching salaries, ACC, Big 12, and the SEC significantly influence other sports winning percentage. Coaching salaries increase winning percentage points by almost 0.000001 for every $1,000 paid in coaches' salaries. ACC, Big 12, or SEC alignment increases winning percentage by approximately four percentage points over the base PAC10/12 conference.

PVAR

Contemporaneous Causal Relationships

DAG from using the PVAR residuals based on the major conferences system is presented in figure 6 using a 0.05 significance level and assuming a multinomial distribution. All three sports winning percentages cause contributions in contemporaneous time. Differences between the all conferences and major conferences contemporaneous time causal relationships are: 1) football and basketball are not related in the major conferences system; 2) the line connecting basketball and contributions is directed towards contributions in the major conferences system but is undirected in the all conferences system; and 3) the line directed towards basketball from other sports becomes undirected in the major conferences system. Similarities between the two contemporaneous causality graphs are lines connecting football and contributions and other sports and contributions are directed towards contributions.

Impulse Response Functions

Dynamic relationships among contributions and sports success for the major conferences is examined through impulse response functions. The same methodology used in the all conferences system is used here; namely using the Cholesky decomposition to generate impulse response functions. The order of the series suggested by figure 6 is football, basketball, other sports, and contributions. This ordering is used to generate impulse response functions. To examine potential differences, impulse response functions for the major conferences using a second ordering, football, other sports, basketball and contributions, are also presented.

Analyzing the impulse response functions for the major conferences using the first ordering, there is an initial positive impact for contributions due to shocks from all three winning percentages (figure 7). Shocking football winning percentage provides different results from the all conferences system, while in the all conferences a steady increase in contributions is seen, the major conferences system sees an initial positive impact then returns toward zero, demonstrating a stable system. Basketball's response due to a shock in football also provides a different response than the all conferences system. While there is a steady increase in basketball winning percentage in the all conferences system, now there is a slight increase then falling to unchanged. Other sports differs as well for the major conferences, here other sports shows an increase then falling back to unchanged, while all conferences system showed a steady decrease.

Shocking basketball also provides different results for all variables, football now responds with an increase then tends back to unchanged. Other sports whom started at zero in the all conferences system and decreased immediately, now start below zero and then increase and then move toward unchanged. Like the all conferences system, contributions start above zero, however, they now fall.

Other sports for the major conferences system provides different responses across the board. Football, basketball, and contributions show positive impacts from a shock in other sports winning percentage, and then tends back to unchanged this differs from the all conferences system. These differences with the major conferences indicate that other sports success may be one key to athletic success, as well as increased contributions. Other sports may be picking up an overall commitment to the sports program.

Shocking contributions provide different results as well for the major conferences system from the all conferences system. Showing a positive impact in the all conferences system, following the same ordering now football, basketball, and other sports now respond with a decrease and tend back toward unchanged. Although these variables all impact contributions, contributions no longer provide the same impact.

The second ordering of football, other sports, basketball and contributions, are presented in figure 8. The response of contributions due to a shock in football, basketball, and other sports all provide a positive impact, and then tend back toward unchanged. Conclusions from these results show that athletic success impacts contributions for the major conferences.

<u>Forecast Error Variance Decompositions</u>

In contemporaneous time for the first ordering, (table 18), football explains 100% of itself, basketball explains 100% of itself, other sports explains 95% of itself, and contributions are explained by football (54%), basketball (6%), other sports (17%), and itself (22%). The second ordering (table 19) gives similar results. Football also explains 100% of itself, other sports explains 99% of itself, and basketball explains 95% of itself. Contributions are explained by football (54%), other sports (13%), basketball (11%), and itself (22%). The major conferences see a heightened impact of football, basketball, and other sports on contributions over the all conferences system through both orderings.

In year nine, decompositions for the major sports system differs substantially over the all conferences system. In the all conferences system, other sports and contributions explained approximately (82%) of the variances for all variables. In the major conference system, football, basketball, and other sports are closer to exogenous, with over (63%) of the variance in any variable explained by that variable. Football, for example, explains (63%) of its own variance with other sports (17%) and contributions (20%) explaining the remainder (table 18). Basketball and other sports are even more exogenous. Contribution's variances are now explained by football (33%), basketball (4%), other sports (39%), and itself (25%). Both orderings demonstrate the impact of football and other sports on contributions nine years out. Further, the decompositions suggest a difference between the major and minor conferences given the substantial differences in inferences between the all and major conferences systems.

Minor Conferences System

A system that contains only the minor athletic conferences, Big East, CUSA, MAC, MWC, Sunbelt, WAC, and FCS/IND (base) is estimated to examine the robustness of the systems. There are 114 universities included, giving a total of 798 observations; summary statistics are given in table 20. The same estimation techniques are used.

Panel Estimation

The minor conference contributions models' R^2 is 0.71 (Table 21). The significant variables at the five percent level are NCAA tournament, enrollment, right licensing, coaches' salaries, Big East, CUSA, and tier 2. Lagged NCAA tournament appearance increases contributions by around $403,000. Enrollment decreases contributions by $50,000 for every 1,000 students enrolled. For every $1,000 received in media right licensing, contributions increase by $159. Similarly, for every $1,000 dollar increase in total coaching staff salaries there is a $289 increase in contributions. Conference alignment with the Big East increases contributions by around $4.4 million, while CUSA has an increase of around $1.3 million over the base conferences of FCS/IND. Tier 2 per seat ticket donations creates a $1.0 million increase in contributions.

The Mountain West conference alignment increases contributions by $933,000 and is significant at the 13% level. Alignment with the WAC is significant at the 14% level and is associated with an increase of $723,000 in contributions over the FCS/IND conferences. Tier 3 decrease contributions by $630,000 relative to the base, which may be because the prices paid to gain the seat offset the amount contributors are able to donate in this system. The Big East conference is significantly different from the other conferences (table 22). Both CUSA and MWC are significantly different from the MAC conference. The Big East and CUSA bring in the largest level of contributions over the base followed by the MWC, WAC, and Sunbelt. Only the MAC brings lower contributions than the base.

Football winning percentage model for the minor conferences system has an R^2 of 0.14 (table 23). Variables significant at the 5% level are lagged bowl game participation, enrollment, right licensing, coaches' salaries, distance, MWC, and Sunbelt. Participation in a bowl games increases football winning percentage by five points the next season. Enrollment increases football winning percentage by five percentage points for every 1,000 students enrolled. Media right licensing increases winning percentage by point two points for every $1,000. Although coaches' salaries increase football winning percentage, the magnitude is virtually zero. Distance increases winning percentage by 0.01 points for every hundred miles away from a major city with population greater than 200,000. Alignment with either the MWC or Sunbelt conferences decreases football winning percentage, the MWC sees a decrease of 18 percentage points while the Sunbelt sees a 14 percentage point decrease in winning percentage relative to the FCS/IND base. MAC alignment is the only variable significance at the 15% level, decreasing football winning percentage by six percentage points.

Basketball winning percentage model for the minor conferences system has an R^2 of 0.14 (table 24). At the five percent significance level, significant variables are NCAA tournament participation, right licensing, and CUSA. Participation in the NCAA tournament increases basketball winning percentage by six percentage points the next year. Media right licensing increases basketball winning percentage, but its value is very small. CUSA alignment increases basketball winning percentage by 10 percentage points over the base. No other variables are significant at the 15% level.

Other sports winning percentage model for the minor conferences system has an R^2 of 0.15 (table 25). Only two variables are significant at the five percent level, enrollment and distance. Enrollment increases winning percentage by two percentage points for every additional 1,000 students enrolled. Distance increases other sports winning percentage by 0.02 percentage points for every hundred miles a university is located from a city of population 200,000 or greater. There are no other variables which significantly impact other sports winning percentage at the 15% level.

PVAR

Contemporaneous Casual Relationships

The DAG from using the PVAR residuals is presented in figure 9 assuming a 0.05 significance level assuming a multinomial distribution. All three sports winning percentages cause contributions in contemporaneous time. Differences between the all conferences and minor conferences in contemporaneous time causal relationships are: 1) football and basketball are not related in minor conferences system but are related in the all conferences system; 2) the line connecting basketball and contributions is directed towards contributions in the minor conferences system, but was undirected in the all conferences system; and 3) the line directed towards basketball from other sports is no longer seen in the minor conferences system. Similarities between the two contemporaneous causality graphs are lines connecting football and contributions and other sports and contributions are directed towards contributions.

Impulse Response Functions

The order of the series suggested by figure 9 is football, basketball, other sports, and contributions to generate the impulse response functions. To examine potential differences, impulse response function for the minor conferences are presented for a second ordering, football, other sports, basketball, and contributions.

Impulse response functions for the minor conferences using the first ordering shows there are positive increases to contributions affiliated with a shock in other sports and basketball winning percentage (figure 10 and figure A.3). Basketball and other sports winning percentage, along with contributions differ from the all conferences system in response to a shock in football. Football winning percentage in this system instead of increasing, now falls toward zero after the initial shock to football. Other sports response also decreases. In this system, contributions initially start above zero and remain around the initial level.

Shocking basketball winning percentage provides no initial increase for football, however, after year one it increases then returns to zero by season two and remains there for the years remaining. Other sports initially starts above zero then by year one it falls below zero and remains there for the remainder of time. Contributions have an initial positive increase and remain around that level for the remainder of the study due to a shock in basketball winning percentage.

Shocking other sports provides similar effects as the all conferences system, although the rate of change may be different for the variables the ending effect is relatively the same. Football may be the only difference, as football winning percentage in the minor conferences system increases the first year then remains unchanged, while in the all conferences system it decreases from zero initially.

Shocking contributions decreases football winning percentage initially, in year one the response works back toward zero. Basketball increases throughout the years presented. Other sports starts at zero and remains unchanged until year one, where the percentage starts to fall steadily for the remainder of the years. The major difference between the two systems is football wining percent's responses; football's response remains unchanged while in the all conferences system it increases steadily in response to a shock in contributions.

In the second order of football, other sports, basketball and contributions shows there is a positive impact on contributions through shocking winning percentages for football, basketball, and other sports (figure 11). The two orderings provide different inferences from the impulse response functions. One can conclude, however, that success through all sports provide a positive impact on contributions.

<u>Forecast Error Variance Decompositions</u>

The forecast error variance decompositions for the two orderings are given in tables 26 and 27. In contemporaneous time for the first ordering, (table 26), both football and basketball explain 100% of explanation of the system, and other sports explains 97% of itself. Contributions are explained by eight percent football, seven percent basketball, 12% from other sports, and 73% from itself. In the second ordering (table 27), both football and other sports explains 100% of itself, and basketball explains nearly 97% of itself. Contributions are explained from eight percent football, 14% from other sports, four percent basketball, and 73% from itself. The minor conferences see a decrease in the impact of football, basketball, and other sports on contributions over the all conferences system.

In year nine of the decomposition for the minor sports system, there are differences from the all conferences system. For the first ordering, football is explained by 70% itself, three percent from basketball, 25% from other sports, and two percent from contributions. Basketball is explained by seven percent football, eight percent itself, 69% from other sports, and 16% from contributions. Other sports are explained by six percent football, three percent basketball, 88% from itself, and three percent from contributions. Contributions are now impacted by football (33%), basketball (4%), other sports (39%), and from itself (25%).

The second ordering, football sees 70% of its impact from itself, 25% from other sports, three percent from basketball, and two percent from contributions. Other sports is explained by eight percent from football, 72% from itself, nine percent from basketball, and 16% from contributions. Basketball is explained by seven percent football, 62% from other sports, and 16% from itself. Contributions are explained by football (5%), other sports (43%), basketball (13%), and from itself (39%).

CHAPTER V

CONCLUSIONS, DISCUSSION, AND LIMITATIONS

Grant, Leadley, and Zygmont (2008 p. 253-322) provide insights on how essential contributions are to universities and athletic departments. “To provide revenue to keep programs operating to maintain and improve facilities, provide funds for travel and equipment, fund salaries, construction of buildings, research labs, and athletic facilities to entice recruits and prospective students to enroll at the university they call the competition for donations.” The “athletic arms race” between universities is alive and well. The objective of this study is to analyze the dynamic relationships between donations to public universities athletic departments and various athletic characteristics such as the winning percentages for the major sports, football and basketball, along with other athletic success. Achieving this objective provides dynamic insight into athletic contributions through investigating each variables role in generating contributions.

A methodology consisting of a combination of panel regression and panel vector auto regressive models (PVAR) are used to estimate the dynamic relationships among the variables. To the author’s knowledge such a methodology has not been used before in any context. The methodology developed provides insight into dynamic relationships in large panel data with many exogenous variables. As such, the methodological contribution goes beyond athletic contributions and sports programs. To understand the dynamics relationships among winning in various sports and contributions, impulse responses are presented along with forecast error variance decompositions. Dynamic inferences and the impacts of the exogenous variables through panel estimation, along with directed acyclical graphs, impulse response functions, and variance decomposition functions have not been examined in previous literature on contributions to athletic departments and provide a new contribution to the literature.

Previous studies beginning from the early 1970's paint a picture of mixed results. Budig (1976), Sigelman and Carter (1979, Turner, Meserve, and Bowen (2001), and Litan, Orszag, and Orszag (2003) conclude there is little evidence to support the notion athletic success influences athletic donations, while others find a positive relationship between athletic success and contributions (Sigelman and Bookheimer 1983: Gaski and Etzel 1984: McCormick and Tinsley 1990: McEvoy 2005: Stinson and Howard 2008; Martinez et al. 2010). Humphreys and Mondello (2007) find athletic success can lead to increased donations; however, these effects are small. Brooker and Klastorin (1981) and McCormick and Tinsley (1990), along with Stinson and Howard (2008), find athletic success not only leads to increases in athletic donations, but also positively impacts academics donations. Over 130 different variables have been tested through the years, over different time periods, and various statistical estimation techniques. With this background, this study helps to provide some order to this mixed picture.

Inferences differ between the three systems estimated, including all conferences, alignment with a major conference, and alignment with a minor conference. Inferences are presented for each step of the methodology, although the discussion focuses on contributions to the athletic program and bigger picture items. The primary inference from the present study is athletic success has an impact on contributions. Influences of athletic success and contributions vary by time period and whether the school is aligned with a major or minor conference. Interested readers are referred to the results chapter for specific results where the three systems are presented.

Panel Estimations

The first step of the methodology is to estimate individual panel equations which include numerous exogenous variables, for the dependent variables contributions and football, basketball, and other sports winning percentages. Major conference alignment provides the highest impact on contributions. In the power conferences, universities are aligned with that particular conference for all sports; whereas, for some universities which are aligned with minor conferences system, football and basketball conference alignment differs. These affiliations help establish traditions, rivalries, a source of conference pride, and heritage. If one was to mention the ACC, one of the first thoughts to come to the author's mind is basketball blue blood programs. The basketball rivalry between Duke and North Carolina, both ACC conferences opponents, is noted as one of the most historical rivalries of all time. The SEC conference is known for its dominance in football. This heritage and source of pride for a specific conference alignment could be a significant factor which drives contributions along with the major conferences generally having a larger fan base because of enrollment and the universities being the "state school."

Besides conference alignment, two other variables standout regardless of the system considered: coaches' salaries and post season exposure through either football bowl games or NCAA basketball tournament. Only coaches' salaries are significant across all systems for the contributions. A $1,000 increase in salaries increases contributions between $289 and $605 depending on the system. The largest impact of salaries to contributions is in the major conferences system. Having high profile coaches and high caliber coaches as measured by salaries increases athletic contributions, but on average the direct effect on contributions are less than the overall salaries paid. Post season exposure increases football and basketball winning percentages the next year, most likely because of recruiting benefits.

Bowl appearances are only significantly in explaining contributions in all conferences system at the five percent level, whereas, bowl wins were not significant in any of the systems. Bowl appearance is significant at the 10% level in the major conference system. Bowl game appearances provide a $1.5 million increase in the all conferences system and a $2.9 million increase for major conferences system. Combining the direct effect of post season appearances on athletic contributions and the effect of winning on contributions discussed below, the goal of becoming post season eligible may be justified. Post season play has a positive impact on winning percentages.

Current student enrollment is used as a proxy for alumni base. It was expected larger enrollment would be associated with more alumni increasing the base of alumni which would produce higher contribution levels. Student enrollment, however, only increases winning percentage for football in the minor conferences system and other sports winning percentage in the all conferences system. In two of the three systems (all conferences and minor conferences), an unexpected result is obtained, namely enrollment decreases contributions. More work is necessary on the impact of alumni base and contributions, along with better variables to represent alumni base.

Per seat ticket donations required by universities to purchase football tickets are, by definition, contributions in themselves. The only significant ticket tiers for contributions is tier two in the minor conferences system. The general lack of significance of this practice of requiring donations to be able to purchase football tickets may indicate that the practice is offset by limiting the funds donors have available to donate to the university. That is, fans are substituting per seat requirements for non-required donations.

PVAR

Based on the Orthogonal Partitioned Regression and Frisch-Waugh Theorems, the residuals from the panel regressions are used to estimate a PVAR in which dynamic analysis is conducted. Before dynamic analysis can be conducted, residuals from the PVAR are transformed by the use of directed acyclical graphs. These graphs provide information flows in contemporaneous time. Regardless of the system, information flows are towards athletic contributions and not towards winning percentage in contemporaneous time. Sports teams, facilities, and coaching staffs are fixed and contributions within a year can do little to impact winning. Within contemporaneous time, there may be spillover or synergistic effects among the sports, that is, information flows among basketball, other sports, and football winning percentages. Information, however, always flows from football winning to the other variables and not towards football in contemporaneous time. This may be a function of timing within an athletic year, football occurs first. Although expected, these results help justify the methodology.

Dynamic effects are provided through impulse response functions and forecast error variance decompositions from the PVAR. The impulse response functions demonstrate positive effects on contributions through increases in winning percentages. Football and basketball winning percentages provide the most dominate impact to contributions, universities will see higher contribution levels with greater football and basketball winning percentages. Football and basketball in the all conferences system continue to increase through the years of study while in major and minor systems they tend toward zero demonstrating a stable system. Other sports winning percentage demonstrates the largest effects on contributions in the major and minor conferences system. Football and basketball winning percentage is important, but do not forget the non-revenue sports. Other sports winning percentage may indicate university's overall commitment to athletics. This overall commitment is a driving force in the systems estimated.

The forecast error variance decompositions also add to the dynamic nature of the study by providing a measure of interaction between variables in a system. All systems provide similar results with football, basketball, and other sports winning percentages and athletic contributions explaining a majority of themselves in contemporaneous time. As time proceeds, the importance of a variable explaining itself generally decreases. The decompositions vary depending on the system more than any of the other results presented. The decompositions suggest a difference between the major and minor conferences given the substantial differences between the all and major conferences systems. However, regardless of the system, commitment to athletics, as given by the proxy - other sports, and contributions itself explain over 58% of the variance in contributions. A university's commitment to athletics appears to be a driving force in increasing contributions and winning. Contributions explain over 24% of itself; this may indicate athletic contributions are partially a function of a set of donors the university goes to each year.

When the major and minor conferences are analyzed separately, football winning and other sports percentages remains highly exogenous to the system, with over 60% of the variation being explained by the variable in question. In the major system, contributions explain over 20% of the variation in football winning percentage in the ninth year. This may indicate the importance and expense of football facilities relative to basketball and other sports. Basketball winning percentage is highly exogenous in the major conference system at 87% of the variation being explained by itself, but in the minor conference this percent drops to 16%.

Reconciling with Previous Results

With the above background and results, this study helps to provide some order to the mixed picture. Panel models allow for the estimation to account for university specific effects to help clear up some confusion. Conference alignment demonstrates the power of specific affiliations, through the various systems. Further, it appears major and minor conferences systems differ. How and which conferences are included, have an impact on inferences obtained. DAG's for each system demonstrate athletic success cause donations in contemporaneous time. Differences over time, however, are noted. Timing of contributions and sports success may have an impact on inferences. This analysis contributes to the previous studies in clearing up some confusion, and furthers the literature through the addition of dynamics. Although confusion still exists which may be partially a function of omitted variables such as donor characteristics as suggested in the theory section. Unfortunately this data is not available

Limitations and Further Research

Besides the normal limitations associated with any statistical study, the primary limitation of the study is the number of years in the data set. Usually, an optimal lag length based on some statistical criteria is determined when estimating a PVAR. The limited number of years forces a PVAR of lag length of one to be estimated.

Estimation of a PVAR with exogenous variables is beyond this study. Therefore, the Orthogonal Partitioned Regression and Frisch-Waugh Theorems are assumed to hold, these theorems have been proven to hold using ordinary least squares regression and they have not been proven for panel regression. This study also assumes the variables are orthogonal or statistically independent. If this assumption does not hold the validity of this study could be deemed inconclusive.

This study looks into the economic effect and its impact on contributions, although there was no significant impact, one might consider looking into the percent change in GDP to see if and increase or decrease has an impact, instead of the overall economic situation. This study analyzes only athletic contributions, however the author believes there could be some spill over to university donations as well. Sanctions have also been considered for this study, although dropped due to not enough data points, if one could investigate bad publicity through arrests, dismissals, and other impacts to athletic programs for non-athletic issues to see if there is an impact on contributions.

Although conference alignment is included for football there are many universities whose alignment changes for basketball. This may create issues in determining true affiliation and level of and contributions because of a specific conference alignment. Although bowl games are included for football for major conferences, FCS schools who participate in the post season playoff are not considered as playing in a bowl because of no FBS specific bowl games. One could also investigate the sort the systems by if they receive an automatic bid a bowl game. Including playoff games as bowl games may change the results on the importance of bowl games especially for minor conferences. Finally, differences among the three systems, all, major, and minor conferences needs further study. Are the differences a function of limited data or some important fundamental factor between the conferences?

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APPENDIX A

Table 1. List of Selected Studies, Their Objectives, and Findings

Study	Objectives	Findings
Amdur (1971)	Examines the relationships between donations and football at big time athletic programs to determine what spurs alumni giving.	Patterns between donations and on field performance.
Springer (1974)	Tests the relationship between winning and contributions.	No school had any significant negative effect and some schools had significant positive relationship between winning and contribuitons.
Sigelman and Carter (1979)	Tries to understand what causes alumni giving to rise and fall with the fortunes of the football and basketball teams.	No relationship was found between success or failure in football and basketball and alumni donations.
Brooker and Klastorin (1981)	Reexamination of Sigelman and Carter (1979) study.	There is a significant relationship between winning percentage and donations, but the relationship depends on institutional factors.
Sigelman and Bookheimer (1983)	Looks into the correlation between athletics success or failure and voluntary contributions made to the athletic departments and academic donations.	Winning football teams are correlated with increased athletic donations, but not academic donations.

Table 1. Continued

Study	Objective	Findings
Coughlin and Erekson (1984)	Search for the determinants of financial support to institutions, and test the relationship between intercollegiate athletics and general university financial support.	Athletic success (football winning percentages, bowl appearances, and basketball winning percentages) is consistently significant determinate of state aid and voluntary support. Athletic department fund raising does not divert contributions from academics. Athletics contributions are found to increase other university contributions.
McCormick and Tinsley (1987)	Tests if college athletic success boosts academic quality of freshman and to see if conference alignment has any effect on incoming students.	Successful intercollegiate athletics draws students, provides "brand name" advertisements, and identification for the school.
McCormick and Tinsley (1990)	Assesses the association between athletics and academics, increases in applications, and the quality of the incoming freshmen, and contributions. .	A 10% increase in athletic booster donations is associated with a 5% increase in general contributions. No evidence of crowding out is found.
Tucker and Amato (1993)	Tests if an athletic program has a positive influence on the academic mission of the university.	Higher quality students shift over time in favor of universities with successful big time football programs. Basketball has no impact on SAT levels or changes in enrollment.

Table 1. Continued

Study	Objective	Findings
Grimes and Chressanthis (1994)	Analyzes the effects of intercollegiate athletics (football, basketball, and baseball) on alumni contributions to the academic endowment of Mississippi State University.	The number of alumni is found to positively affect giving; athletics success influence donations to academics. Winning on TV is related with more affluent gifts. NCAA sanctions negatively impact donations.
Murphy and Trandel (1994)	Tests the relation between universities' football records and the size of a university's applicant pool.	Winning record of a university's football team is positively related to the number of student applications for admittance received. Increasing winning percentage by 25% produces a 1.3% increase in applicants the following year.
Mixon (1995)	Analyzes the effects of athletic success upon a university.	Results suggest that athletics helps the academic mission, the existence of contrary evidence regarding graduation rates and other important factors point out that the role of athletics needs further examination.
Baade and Sundberg (1996a)	Examines the impact of successful football and men's basketball programs have on alumni giving.	Alumni of colleges respond more generously than non-alumni to solicitations. Public universities see lower gifts than private schools. Successful football and basketball records do not translate to higher gifts totals; however, bowl games have a positive effect on donations.

Table 1. Continued

Study	Objective	Findings
Baade and Sundberg (1996b)	Assesses what drives alumni generosity, analyze student, and institutional characteristics.	A positive relationship exists between alumni giving and athletic success. Student demographics, (Percent minority, Percent female students) demonstrate a significant negative effect on giving. University age has a positive significant on gifts. Enrollment and research do not have an impact on giving.
Goff (2000)	Reviews and extends existing work on the effects of college athletics. Analyzes athletics benefits including direct and indirect benefits as increased student applications and enrollment.	Athletic success, particularly significant improvement can substantially increase national exposure for universities regardless of their academic reputation. Achievements in athletics appear to substantially increase general giving to universities. Major athletic achievements can increase applications/enrollment. Dropping football can have a negative impacts on enrollment and other variables. NCAA sanctions may offset the gains made by past athletic success, but the evidence does not show that negative exposure does more than negate the positive influence of past success.
Rhoads and Gerking (2000)	Observes the role of successful Division I football and basketball programs in motivating alumni and other donors to make charitable donations.	Post season play for both football and basketball increase donations from alumni and non-alumni. Alumni contributions increase with bowl wins and decrease if team is placed on probation. However, there is no change in giving for non-alumni.

Table 1. Continued

Study	Objective	Findings
Litan, Orszag, and Orszag (2003)	Examines ten hypotheses concerning college athletics.	No robust relationships between football spending or success and alumni giving are found. Their analysis fails to reject five of their null hypotheses.
Frank (2004)	Do successful athletic programs stimulate additional applications from prospective students and greater contributions by alumni and other donors?	This study is a review of the literature; reported findings are mixed. If success in athletics does generate indirect benefits, the effects are small.
Stinson and Howard (2004)	Who donates to educational institutions in support of academics and athletics? Does the improved performance of athletic teams influence both types of giving? Does increased giving to athletics have a negative impact on giving to education?	Athletic success at Oregon is associated with an increase in donors to Oregon from 297 in 1994 to 962 in 2002. In academics, there is a neutral to negative effect on donations because of athletic success.
Tucker (2004)	Examines if there is statistical evidence that student graduation rates or alumni giving rates are influenced by football or basketball success for major universities.	A positive statistical relationship is found between football success and overall graduation rates and donations; basketball success has no relationship with graduation rates.

Table 1. Continued

Study	Objective	Findings
Mixon and Trevino (2005)	Examines the relationship between a university's football heritage and its freshman retention and graduation rates.	Find a positive and significant relationship between a university's football success and SAT scores. Evidence supports the hypothesis that athletics serve the institution's academic mission and provides students with a respite from the psychic costs associated with college life.
Humphreys and Mondello (2007)	The hypothesis that donations to universities vary with athletic success is tested using a comprehensive panel data set.	Appearing in bowl games and the postseason basketball tournaments has no effect on unrestricted donations; however, both appearances are correlated with an increase in restricted donations. Basketball success at private universities is statically significant.
Stinson and Howard (2007)	This study seeks to clarify the disparate findings of previous research, which examined giving by alumni and non-alumni to academic and athletic programs at institutions participating in NCAA Division I-A football.	Total giving to schools with the strongest academic reputations is less susceptible to changes in athletic teams' futures than total giving to institutions not included in the top tier of academically ranked schools. Top ranked schools appear immune to the influence of athletic performance.
Stinson and Howard (2008)	Examines whether changes at the Division I-A level are also evident at schools that compete at the Division I-AA or I-AAA level.	Successful athletic programs influence both the number of donors making gifts to an institution and the average dollar amount of those gifts. Winning football and men's basketball teams have direct effects on both athletic and academic gifts. No crowding out effects take place; athletic success enhances both athletic and academic support.

Table 1. Continued

Study	Objective	Findings
Orszag and Israel (2009)	This study is an update commissioned by the NCAA to review the 2003 study "The Effects of Collegiate Athletics: An Interim Report" and 2005 study "The Empirical Effects of Collegiate Athletics: An Update.	A small positive significant relationship between greater operating expenses and football success is found. No statistically significant relationship is found between total operating expenses and winning percentage for basketball along with coaching salaries or scholarships and a team's winning percentage. No statistically significant relationship is found between finishing in the top 25 of the AP football poll and revenue. A statistically significant relationship between changes in athletic expenses by Division I-A schools and alumni giving is discovered. There is no evidence of a relationship between lagged expenses and current alumni giving. An expected causal relationship between expenditures and alumni giving could only be demonstrated with a lag. No statistical relationship between athletic expense and alumni giving is found.
Martinez et al. (2010)	This study reviews 30 years of research from 1976-2008 concerning athletics and institutional fundraising.	Meta-analysis results indicate that intercollegiate athletics has a small, but statically significant effect on contributions. Follow-up analysis reveal four significant moderators on strength of athletics and private giving relationship: the gift target, athletic vs. academic programs, alumni status of the donor, level of NCAA membership (Division I, II, III), and if the institution competes in football.

Table 1. Continued

Study	Objective	Findings
Dial Jr. (2012)	Studies what factors drive institutional investments into athletics at private, Div. III colleges, and universities.	Athletics and other non-academic initiatives play a role in student's college choices. Weak relationships are found between winning percentages and appearances in elite athletic events such as big bowl games or the Final Four and National Championship.
Koo and Dittmore (2014)	Examines whether athletic contributions are associated with success in intercollegiate athletic programs and to explore whether athletic contributions crowd out academic giving.	For every 1% increase in football win-loss record athletic donations increase by $452,000 and academic donations increase by $1.5 million. If enrollment increases by 1%, there is a $405 increase in current donations. 1% increases in graduation rate results in an additional $116,000 in donations. If the school increases in ranking an increase of $3.95 million occurs. Every $1 dollar increase in athletic contributions during the previous season results in $0.48 cents increase in academics donations the following year.

Table 2. List of Variables Used in Previous Studies

Variable Description	Reference Number	Variable Description	Reference Number
	Giving Variables		
Athletic Donations	1	Percent Change in Total Alumni Giving	8
Percent Change in the Dollar Value of the Gifts	2	Average Gift to Athletics	9
Percent of Donations Given to Athletics	3	Average Gift to Academics	10
Percent of Donations Given to Academics	4	Average Gift Size of Split Donors	11
Percent of Donors Making a Split Gift	5	Average Annual Total Support	12
Average Size of Gift for Split Donors for Both Athletics and Academics	6	Real Restricted Gift	13
Real Unrestricted Gift	7		
	Football Variables		
Football Record	14	Bowl Appearance	25
Bowl Win	15	Football Record Lagged a Year	26
Football within Conference Record	16	Won Football Championship	27
Top 20 Ranking in Football Poll	17	Football Administration Expense	28
Total Football Expense	18	Football Marketing Expense	29
Total Football Team Expense	19	US News X FB Win Percentage	30
US News X Bowl Game	20	US News X Bowl Win	31
US News X Football Tradition	21	Football School	32
FB Tradition X FB Winning Percentage	22	BCS	33
Football Tradition	23	Football Athletes and Coaches Expense	34
Adding/Dropping Football	24		
	Basketball Variables		
Basketball Record	35	Basketball Record Lagged A Year	41
Top 20 Ranking in Basketball Poll	36	NCAA Tournament Appearance	42
Basketball Tradition	37	NIT Tournament Appearance	43
Won Basketball Championship	38	Total Men's Basketball Expense	44

Table 2. Continued

Variable Description	Reference Number	Variable Description	Reference Number
Basketball Athletes and Coaches Expense	39	Basketball Team Expense	45
Basketball Marketing Expense	40	Basketball Administration Expense	46
Football and Basketball Variables			
Lagged Top 20 Ranking in Football/Basketball	47	Football and Basketball Expense Lagged 1 Year	51
Total Football and Men's Basketball Expense	48	Narrow Football and Men's Basketball Revenue	52
Football and Basketball Net Revenue	49	Narrow Football and Men's Basketball Expense	53
Football and Basketball Net Revenue Lagged 1 Year	50		
General Athletic Variables			
TV Appearances	54	Average of Total Athletic Operating Expense by Other Schools in Conference	64
Average of Football Expenses of Other Schools in Conference	55	Average of Men's Basketball Expenses of Other Schools in Conference	65
Total Athletic Operating Expense by Other Schools in Conference Lagged 1 Year	56	Average Football and Basketball Expense by Other Schools in Conference Lagged 1 Year	66
Total Expense on Sports Other Than Football and Basketball	57	Total Expense on Women's' Sports	67
Total Athletic Expense	58	Sanctions	68
Athletic Conference	59	Total Athletics Success	69
Athletic Capital Stock	60	Department Total Athletic Revenue	70
Baseball Record	61	Only Game in Town	71
Division 1	62	Total Athletic Operation Expense	72

Table 2. Continued

Variable Description	Reference Number	Variable Description	Reference Number
Total Athletic Operations Expense Lagged 1 Year	63		
	General University Variables		
Top Undergraduate Quality	73	SAT	95
Top Faculty (Average Pay of Faculty)	74	75th Percentile ACT Composite Scores	96
Tuition	75	Relative Tuition	97
Research Institution	76	Land Grant University	98
Religious Affiliation	77	US News Ranking	99
Enrollment	78	Real Expenditure Per Student	100
Applications	79	Number of High School Graduates in the State	101
Volumes in Library	80	Private School	102
University Age	81	Public School	103
Graduation Rates	82	Student to Faculty Ratio	104
Real State Appropriations	83	Appropriations	105
Percent of Faculty Holding Dr. Degrees	84	Historically Black University	106
Real Total Education	85	General Expenditures	107
Male Undergraduate Enrollment	86	Endowment Per Student	108
Number of Ph. D's Awarded Per Faculty	87	Percent of Female Students	109
Percent of Minority Students	88	Percent on Financial Aid	110
Percent Accepted	89	Log of Enrollment	111
Log of Tuition and Fees	90	Log of the Percentage of Students in the Top Ten Percent of High School Class	112
Log of the Fitted Value of Instructional Expenditure per Student	91	Log of Percentage of Applicants Accepted	113
Log of Research Expenditure per Student	92	Log Percentage of Female Students	114

Table 2. Continued

Variable Description	Reference Number	Variable Description	Reference Number
Log Percentage of Minority Students	93	Log of Scholarship and Fellowship per Students	115
Log of Percent of Students on Financial Aid	94		
	Alumni Variables		
Percent Change in Proportion of Alumni Who Gave to the University	116	Total Alumni Revenue	124
Football and Basketball Alumni Revenue	117	Alumni Giving to Annual Fund	125
Alumni Status X US News	118	Alumni Status X Bowl Game	126
Alumni Status X Football Tradition	119	Alumni Status X FB Winning Percentage	127
Alumni Status X Bowl Win	120	Alumni Per Student	128
Log of Alumni Per Student	121	Average Alumni Giving Rate	129
Log of Alumni Solicited/Alumni Record	122	Log of Average Gift per Alumni	130
Alumni Base	123	Alumni Status	131
	Location Variables		
West	132	Northeast	135
Midwest	133	Residential	136
Urban/Rural Location	134		
	Economic Variables		
Gross National Product Information	137	Per Capita State Income	139
Tax Effort	138		

Table 3. List of Studies, Years of Data, Variables Used, Significant Variables, and Total Variables

Study	Years of Data	Observations	Variables	Positive Significance	Negative Significance	Total Number of Variables
Amdur (1971)	1959-1960	NA	1, 14			2
Sigelman and Carter (1979)	1960-1976	135	2, 8, 14, 25, 35, 116		8, 14, 25, 116	6
Brooker and Klastorin (1981)	1962-1971	58	1, 14, 17, 25, 26, 35, 36, 41, 47, 116, 137	1, 14, 17, 35, 116, 137		11
Sigelman and Bookheimer (1983)	1980-1981	57	1, 14, 35, 71, 76, 81, 123, 125	14, 35		8
Coughlin and Erekson (1984)	1980-1981	52	1, 14, 25, 35, 42, 54, 73, 74, 75, 78, 81, 95, 97, 138, 139	1, 14, 35, 78, 81, 95		15
McCormick and Tinsley (1987)	1971-1984	217	14, 35, 74, 75, 78, 80, 86, 87, 95, 102, 104, 108	14, 35, 74, 75, 104, 108		12
McCormick and Tinsley (1990)	1979-1983	1	3, 4, 26, 71, 75, 78, 100, 123, 139	3, 71, 100, 123	75, 78	13
Tucker and Amato (1993)	1980-1990	63	14, 17, 25, 35, 36, 42, 74, 75, 78, 80, 81, 95, 102, 104	14, 25, 78, 80		14
Grimes and Chressanthis (1994)	1962-1991	1	14, 25, 35, 42, 54, 61, 68, 69, 77, 105, 123, 139	14, 35, 54, 69, 105, 139		12
Murphy and Trandel (1994)	1978-1987	55	9, 16, 74, 75, 79, 139	16, 74		6
Mixon (1995)	1978-1992	118	35, 42, 78, 84, 95, 102, 104, 106	42, 78, 84, 102	104, 106	8

Table 3. Continued

Study	Years of Data	Observations	Variables	Positive Significance	Negative Significance	Total Number of Variables
Baade and Sundberg (1996a)	1973-1990	300+	14, 18, 35, 78, 88, 89, 100, 109, 110, 111, 128	14, 100, 128	78, 88, 89, 109, 110	11
Baade and Sundberg (1996b)	1989-1990	375+	90, 91, 92, 93, 94, 111, 112, 113, 114, 115, 121, 122, 130	90, 121, 122	93, 114	13
Goff (2000)	1960-1993	3	1, 14, 24, 25, 35, 59, 74, 101	Not Reported in Study	Not Reported in Study	8
Rhoads and Gerking (2000)	1986-1996	87	1, 14, 25, 35, 42, 68, 76, 81, 95, 98, 103, 132, 133, 135	25, 42, 81, 95, 103	76	14
Litan et al. (2003)	1993-2001	100+	1, 14, 17, 18, 19, 28, 29, 34, 35, 36, 39, 40, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 60, 63, 64, 65, 66, 67, 70, 72, 96, 117, 124	17, 18, 19, 44, 55, 56, 60, 64, 65		36
Stinson and Howard (2004)	1994-2002	1	1, 3, 4, 5, 6, 9, 10, 11, 69	69		9
Tucker (2004)	1996-2002	78	14, 17, 25, 35, 36, 42, 74, 78, 81, 82, 102, 104, 129	14, 17, 25, 74, 81, 102	78	13
Mixon and Trevino (2005)	2000-2001	83	14, 79, 84, 102, 104	14, 79, 84, 102		5
Humphreys and Mondello (2007)	1976-1996	320	7, 12, 13, 17, 25, 27, 36, 38, 42, 62, 78, 83, 102, 103, 107, 139	25, 42, 78, 83, 139		27

Table 3. Continued

Study	Years of Data	Observations	Variables	Positive Significance	Negative Significance	Total Number of Variables
Stinson and Howard (2007)	1998-2003	NA	14, 15, 20, 21, 22, 23, 25, 30, 31, 33, 62, 77, 99, 102, 118, 119, 120, 126, 127, 131, 134, 139	Not Reported in Study	Not Reported in Study	22
Stinson and Howard (2008)	1998-2003	208	3, 9, 10, 12, 17, 25, 32, 36, 37, 42, 43, 77, 99, 102, 123, 131, 134, 139	Not Reported in Study	Not Reported in Study	18
Orszag and Israel (2009)	2004-2007	119	1, 14, 17, 18, 19, 28, 29, 34, 35, 36, 39, 40, 44, 45, 46, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 60, 63, 64, 65, 66, 67, 70, 72, 96, 117, 124	17, 18, 19, 44, 55, 56, 60, 64, 65		36
Koo and Dittmore (2014)	2002-2012	155	1, 26, 41, 78, 82, 100, 139	1, 26, 78, 82, 100		7

Table 4. Summary Statistics All Conferences

Variable	Average	Standard Deviation	Minimum	Maximum	Range
Football Win %	0.50	0.22	0	1	1
Football Bowl Game	0.33	0.47	0	1	1
Football Bowl Win	0.16	0.37	0	1	1
Basketball Win %	0.53	0.17	0.03	0.95	0.92
Basketball NCAA Tournament	0.23	0.42	0.00	1.00	1.00
Other Sports Win %	0.51	0.10	0.15	0.80	0.65
Enrollment in Thousands	23	12	1	72	71
Contributions in Thousands	6,743	10,682	16	21,1023	21,1007
Right Licensing in Thousands	8,451	10,693	42	53,892	53,850
Coaches' Salaries in Thousands	10,706	8,957	0	53,526	53,526
GDP in Billions	30,388	43,037	12,277	144,180	131,903
Distance in Miles	74	69	0	366	366

1) Current year's dollars.

Table 5. Contributions to Athletic Departments All Conferences

Random -effects GLS regression	Number of obs =	1120
Group variable: id	Number of groups =	160
R-sq: within = 0.0311	Obs per group: min=	7
between = 0.7749	avg =	7
overall = 0.5727	max =	7
	Wald chi2(21) =	552.24
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.00

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	1470.861	674.818	2.180	0.029	148.242	2793.480
Bwin	-778.028	697.660	-1.120	0.265	-2145.416	589.361
NCAA	888.100	567.025	1.570	0.117	-223.248	1999.448
Student	-40.772	45.155	-0.900	0.367	-129.275	47.731
Right Licensing	-0.082	0.075	-1.100	0.273	-0.230	0.065
Salary	0.561	0.090	6.260	0.000	0.385	0.737
GDP	0.002	0.004	0.370	0.713	-0.007	0.010
Distance	8.257	5.911	1.400	0.162	-3.328	19.842
ACC	5834.879	2198.147	2.650	0.008	1526.590	10143.170
Big10	5978.153	2369.887	2.520	0.012	1333.260	10623.050
Big12	11726.710	2009.898	5.830	0.000	7787.380	15666.030
BigEast	2650.081	2308.244	1.150	0.251	-1873.995	7174.156
CUSA	544.641	1975.784	0.280	0.783	-3327.825	4417.108
MAC	-674.179	1555.514	-0.430	0.665	-3722.930	2374.572
MWC	711.540	2015.581	0.350	0.724	-3238.926	4662.006
PAC1012	5887.574	2200.281	2.680	0.007	1575.103	10200.050
SEC	11478.130	2304.674	4.980	0.000	6961.050	15995.210
SunBelt	273.496	1680.984	0.160	0.871	-3021.171	3568.164
WAC	728.234	1706.297	0.430	0.670	-2616.047	4072.514
Tier 2	618.846	1175.066	0.530	0.598	-1684.240	2921.932
Tier3	1314.926	1124.327	1.170	0.242	-888.714	3518.566
Constant	-1771.070	1123.673	-1.580	0.115	-3973.428	431.289
sigmau	4000.247					
sigmae	6181.380					
Rho	0.295	(fraction of variance due to ui)				

Table 6. P-Value of Differences in Contributions Between Conferences Using Pairwise F-tests

	ACC	Big10	Big12	BigEast	CUSA	MAC	MWC	PAC1012	SEC	SunBelt	WAC
ACC	--										
Big10	0.953	--									
Big12	**0.007**	**0.007**	**--**								
BigEast	0.223	0.197	**0.000**	--							
CUSA	**0.037**	**0.040**	**0.000**	0.422	--						
MAC	**0.019**	**0.040**	**0.000**	0.179	0.578	--					
MWC	**0.050**	**0.009**	**0.000**	0.467	0.947	0.543	--				
PAC1012	0.983	0.969	**0.007**	0.201	**0.025**	**0.001**	**0.037**	--			
SEC	**0.013**	**0.013**	0.905	**0.001**	**0.000**	**0.000**	**0.000**	**0.014**	--		
SunBelt	**0.033**	**0.033**	**0.000**	0.362	0.909	0.644	0.856	**0.027**	**0.000**	--	
WAC	**0.046**	**0.046**	**0.000**	0.458	0.938	0.495	0.994	**0.039**	**0.000**	0.835	--

Significance at 5% noted by bold numbers.

Table 7. Football Winning Percentage All Conferences

Random -effects GLS regression	Number of obs =	1120
Group variable: id	Number of groups =	160
R-sq: within = 0.0078	Obs per group: min=	7
between = 0.3515	avg =	7
overall = 0.1724	max =	7
	Wald chi2(21) =	93.19
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.00

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	0.067	0.019	3.620	0.000	0.031	0.104
Bwin	0.014	0.019	0.740	0.460	-0.024	0.052
NCAA	-0.018	0.016	-1.170	0.244	-0.049	0.012
Student	0.001	0.001	1.270	0.205	-0.001	0.004
Right Licensing	0.000	0.000	0.910	0.365	0.000	0.000
Salary	0.000	0.000	0.690	0.493	0.000	0.000
GDP	0.000	0.000	-0.960	0.338	0.000	0.000
Distance	0.000	0.000	2.720	0.006	0.000	0.001
ACC	-0.099	0.057	-1.720	0.085	-0.211	0.014
Big10	-0.093	0.063	-1.470	0.142	-0.216	0.031
Big12	-0.045	0.053	-0.850	0.394	-0.149	0.059
BigEast	0.030	0.060	0.510	0.613	-0.087	0.148
CUSA	-0.065	0.051	-1.270	0.203	-0.165	0.035
MAC	-0.074	0.040	-1.840	0.066	-0.152	0.005
MWC	-0.097	0.052	-1.840	0.065	-0.199	0.006
PAC1012	-0.108	0.058	-1.870	0.062	-0.220	0.005
SEC	-0.022	0.061	-0.360	0.717	-0.141	0.097
SunBelt	-0.119	0.044	-2.730	0.006	-0.205	-0.034
WAC	-0.033	0.044	-0.760	0.450	-0.120	0.053
Tier 2	0.032	0.030	1.070	0.285	-0.027	0.092
Tier3	0.047	0.029	1.630	0.103	-0.010	0.104
Constant	0.405	0.029	13.930	0.000	0.348	0.462
sigmau	0.098					
sigmae	0.168					
Rho	0.253	(fraction of variance due to ui)				

Table 8. Basketball Winning Percentage All Conferences

Random -effects GLS regression	Number of obs =	1120
Group variable: id	Number of groups =	160
R-sq: within = 0.0007	Obs per group: min=	7
between = 0.4240	avg =	7
overall = 0.2043	max =	7
	Wald chi2(21) =	129.44
corr(u_i, X) = 0 (assumed)	Prob > chi2 =	0.00

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	0.000	0.014	-0.030	0.977	-0.029	0.028
Bwin	0.001	0.015	0.060	0.949	-0.029	0.031
NCAA	0.063	0.012	5.250	0.000	0.040	0.087
Student	0.000	0.001	0.360	0.718	-0.001	0.002
Right Licensing	0.000	0.000	0.310	0.753	0.000	0.000
Salary	0.000	0.000	1.080	0.282	0.000	0.000
GDP	0.000	0.000	0.610	0.545	0.000	0.000
Distance	0.000	0.000	0.780	0.434	0.000	0.000
ACC	0.095	0.040	2.350	0.019	0.016	0.175
Big10	0.062	0.046	1.350	0.177	-0.028	0.153
Big12	0.078	0.038	2.060	0.040	0.004	0.152
BigEast	0.064	0.042	1.520	0.129	-0.019	0.146
CUSA	0.120	0.035	3.390	0.001	0.051	0.189
MAC	0.010	0.028	0.360	0.716	-0.044	0.064
MWC	0.099	0.037	2.700	0.007	0.027	0.171
PAC1012	0.065	0.041	1.600	0.109	-0.015	0.146
SEC	0.061	0.044	1.400	0.162	-0.025	0.147
SunBelt	-0.018	0.031	-0.610	0.545	-0.078	0.041
WAC	0.048	0.031	1.570	0.117	-0.012	0.108
Tier 2	-0.032	0.021	-1.540	0.122	-0.073	0.009
Tier3	-0.021	0.020	-1.070	0.284	-0.061	0.018
Constant	0.446	0.020	22.010	0.000	0.407	0.486
sigmau	0.061					
sigmae	0.129					
Rho	0.184	(fraction of variance due to ui)				

Table 9. Other Sports Winning Percentage All Conferences

Random -effects GLS regression	Number of obs =	1120
Group variable: id	Number of groups =	160
R-sq: within = 0.0006	Obs per group: min=	7
between = 0.5106	avg =	7
overall = 0.3583	max =	7
	Wald chi2(21) =	165.79
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.00

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	-0.002	0.007	-0.320	0.751	-0.015	0.011
Bwin	0.003	0.007	0.490	0.624	-0.010	0.017
NCAA	0.006	0.006	1.080	0.279	-0.005	0.017
Student	0.002	0.001	3.090	0.002	0.001	0.003
Right Licensing	0.000	0.000	-0.210	0.836	0.000	0.000
Salary	0.000	0.000	1.910	0.056	0.000	0.000
GDP	0.000	0.000	-0.620	0.534	0.000	0.000
Distance	0.000	0.000	0.620	0.533	0.000	0.000
ACC	0.081	0.027	3.050	0.002	0.029	0.133
Big10	0.014	0.027	0.530	0.594	-0.038	0.066
Big12	0.058	0.023	2.450	0.014	0.012	0.104
BigEast	0.026	0.028	0.900	0.366	-0.030	0.081
CUSA	0.014	0.025	0.580	0.561	-0.034	0.063
MAC	-0.002	0.019	-0.130	0.898	-0.041	0.036
MWC	0.046	0.024	1.880	0.061	-0.002	0.093
PAC1012	0.021	0.026	0.790	0.429	-0.030	0.072
SEC	0.061	0.027	2.270	0.023	0.008	0.113
SunBelt	0.022	0.020	1.100	0.272	-0.017	0.062
WAC	0.014	0.021	0.680	0.496	-0.027	0.056
Tier 2	0.017	0.015	1.150	0.249	-0.012	0.046
Tier3	0.023	0.014	1.670	0.096	-0.004	0.051
Constant	0.423	0.014	30.590	0.000	0.396	0.450
sigmau	0.05					
sigmae	0.06					
Rho	0.44	(fraction of variance due to ui)				

Table 10. Forecast Error Variance Decomposition All Conferences
Ordering of Football, Other Sports, Basketball and Contributions

Dependent Variable	Step	Football Win %	Other Sports Win %	Basketball Win %	Contributions
Football Win %	0	1.000	0.000	0.000	0.000
Other Sports Win %	0	0.005	0.995	0.000	0.000
Basketball Win %	0	0.001	0.033	0.966	0.000
Contributions	0	0.183	0.022	0.290	0.506
Football Win %	1	0.749	0.020	0.131	0.100
Other Sports Win %	1	0.014	0.845	0.100	0.040
Basketball Win %	1	0.026	0.070	0.732	0.172
Contributions	1	0.148	0.036	0.234	0.582
Football Win %	4	0.154	0.264	0.206	0.376
Other Sports Win %	4	0.057	0.434	0.206	0.304
Basketball Win %	4	0.067	0.285	0.270	0.378
Contributions	4	0.084	0.257	0.209	0.451
Football Win %	9	0.069	0.344	0.211	0.376
Other Sports Win %	9	0.067	0.349	0.211	0.373
Basketball Win %	9	0.068	0.345	0.212	0.376
Contributions	9	0.068	0.343	0.211	0.378

Table 11. Forecast Error Variance Decomposition All Conferences Ordering of Football, Basketball, Other Sports, and Contributions

Variable	Step	Football Win %	Basketball Win %	Other Sports Win %	Contributions
Football Win %	0	1.000	0.000	0.000	0.000
Basketball Win %	0	0.001	0.999	0.000	0.000
Other Sports Win %	0	0.005	0.033	0.962	0.000
Contributions	0	0.183	0.309	0.002	0.506
Football Win %	1	0.749	0.109	0.043	0.100
Basketball Win %	1	0.026	0.725	0.077	0.172
Other Sports Win %	1	0.014	0.050	0.896	0.040
Contributions	1	0.148	0.219	0.051	0.582
Football Win %	4	0.154	0.126	0.344	0.376
Basketball Win %	4	0.067	0.191	0.364	0.378
Other Sports Win %	4	0.057	0.110	0.529	0.304
Contributions	4	0.084	0.132	0.334	0.451
Football Win %	9	0.069	0.119	0.436	0.376
Basketball Win %	9	0.068	0.120	0.437	0.376
Other Sports Win %	9	0.067	0.119	0.441	0.373
Contributions	9	0.068	0.119	0.435	0.378

Table 12. Summary Statistics Major Conferences

Variable	Average	Standard Deviation	Minimum	Maximum	Range
Football Win%	0.57	0.21	0	1	1
Football Bowl Game	0.68	0.47	0	1	1
Football Bowl Win	0.34	0.48	0	1	1
Basketball Win %	0.60	0.15	0.19	0.95	0.92
Basketball NCAA Tournament	0.46	0.50	0.00	1.00	1.00
Other Sports Win %	0.59	0.09	0.30	0.80	0.50
Enrollment in Thousands	34	11	17	72	55
Contributions in Thousands	18,141	13,942	442	21,1023	21,1058
Right Licensing in Thousands	22,799	8,918	1,798	53,892	52,094
Coaches' Salaries in Thousands	22,091	7,471	1,364	53,526	52,162
GDP in Billions	30,388	43,037	12,277	144,180	131,903
Distance in Miles	65	65	0	316	316

1) Current year's dollars.

Table 13. Contributions to Athletic Departments Major Conferences

Random -effects GLS regression	Number of obs =	322
Group variable: id	Number of groups =	46
R-sq: within = 0.0371	Obs per group: min=	7
between = 0.3687	avg =	7
overall = 0.1885	max =	7
	Wald chi2(21) =	30.82
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.00059

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	2911.019	1777.071	1.640	0.101	-571.975	6394.014
Bwin	-1518.824	1664.746	-0.910	0.362	-4781.666	1744.017
NCAA	990.238	1540.671	0.640	0.520	-2029.421	4009.897
Student	10.945	143.938	0.080	0.939	-271.169	293.059
Right Licensing	-0.155	0.154	-1.010	0.313	-0.456	0.146
Salary	0.605	0.202	2.990	0.003	0.208	1.002
GDP	0.011	0.014	0.740	0.458	-0.017	0.038
Distance	23.096	21.603	1.070	0.285	-19.245	65.438
ACC	-1177.509	4910.913	-0.240	0.811	-10802.720	8447.703
Big10	1240.790	5007.714	0.250	0.804	-8574.149	11055.730
Big12	5189.792	4636.950	1.120	0.263	-3898.463	14278.050
SEC	5201.299	4634.531	1.120	0.262	-3882.215	14284.810
Tier 2	3178.455	4480.912	0.710	0.478	-5603.972	11960.880
Tier3	4680.597	4055.813	1.150	0.248	-3268.650	12629.840
Constant	-1045.644	7567.310	-0.140	0.890	-15877.300	13786.010
sigmau	7850.926					
sigmae	11498.880					
Rho	0.318	(fraction of variance due to ui)				

Table 14. P-Values of Differences in Contributions Between Conferences Using Pairwise F-tests

	ACC	Big10	Big12	SEC
ACC	--			
Big10	0.646	--		
Big12	0.138	0.372	--	
SEC	0.151	0.395	0.998	--

Significance at .5% noted by bold numbers

Table 15. Football Winning Percentage Major Conferences

Random -effects GLS regression	Number of obs =	322
Group variable: id	Number of groups =	46
R-sq: within = 0.0172	Obs per group: min=	7
between = 0.5975	avg =	7
overall = 0.2371	max =	7
	Wald chi2(21) =	59.38
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.00

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	0.088	0.026	3.330	0.001	0.036	0.140
Bwin	0.030	0.025	1.190	0.235	-0.019	0.079
NCAA	-0.010	0.022	-0.460	0.645	-0.054	0.033
Student	-0.002	0.001	-1.140	0.255	-0.005	0.001
Right Licensing	0.000	0.000	-0.050	0.959	0.000	0.000
Salary	0.000	0.000	2.480	0.013	0.000	0.000
GDP	0.000	0.000	-0.690	0.490	0.000	0.000
Distance	0.000	0.000	0.630	0.532	0.000	0.001
ACC	0.001	0.050	0.020	0.986	-0.097	0.098
Big10	0.032	0.053	0.590	0.555	-0.073	0.136
Big12	0.067	0.049	1.380	0.167	-0.028	0.162
SEC	0.064	0.048	1.310	0.189	-0.031	0.159
Tier 2	0.049	0.045	1.100	0.270	-0.038	0.137
Tier3	0.030	0.041	0.740	0.459	-0.050	0.110
Constant	0.336	0.079	4.260	0.000	0.181	0.490
sigmau	0.054					
sigmae	0.168					
Rho	0.094	(fraction of variance due to ui)				

Table 16. Basketball Winning Percentage Major Conferences

Random -effects GLS regression	Number of obs =	322
Group variable: id	Number of groups =	46
R-sq: within = 0.0076	Obs per group: min=	7
between = 0.5566	avg =	7
overall = 0.2858	max =	7
	Wald chi2(21) =	41.11
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.0002

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	-0.026	0.019	-1.350	0.176	-0.064	0.012
Bwin	0.006	0.018	0.340	0.736	-0.030	0.042
NCAA	0.080	0.016	4.930	0.000	0.048	0.112
Student	0.001	0.001	1.290	0.196	-0.001	0.004
Right Licensing	0.000	0.000	-0.570	0.569	0.000	0.000
Salary	0.000	0.000	1.350	0.177	0.000	0.000
GDP	0.000	0.000	-0.880	0.379	0.000	0.000
Distance	0.000	0.000	0.130	0.898	0.000	0.000
ACC	0.035	0.036	0.980	0.329	-0.036	0.106
Big10	0.005	0.039	0.120	0.903	-0.071	0.081
Big12	0.020	0.035	0.570	0.572	-0.049	0.089
SEC	0.011	0.035	0.300	0.761	-0.058	0.080
Tier 2	-0.018	0.033	-0.560	0.573	-0.082	0.046
Tier3	-0.003	0.030	-0.090	0.929	-0.061	0.056
Constant	0.492	0.057	8.580	0.000	0.379	0.604
sigmau	0.039					
sigmae	0.120					
Rho	0.094	(fraction of variance due to ui)				

Table 17. Other Sports Winning Percentage Major Conferences

Random -effects GLS regression	Number of obs =	322
Group variable: id	Number of groups =	46
R-sq: within = 0.0058	Obs per group: min=	7
between = 0.3941	avg =	7
overall = 0.2621	max =	7
	Wald chi2(21) =	31.95
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.0041

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	-0.001	0.008	-0.160	0.875	-0.016	0.014
Bwin	-0.004	0.007	-0.510	0.609	-0.018	0.010
NCAA	-0.006	0.007	-0.890	0.376	-0.019	0.007
Student	0.001	0.001	1.420	0.156	0.000	0.003
Right Licensing	0.000	0.000	-0.950	0.340	0.000	0.000
Salary	0.000	0.000	1.710	0.086	0.000	0.000
GDP	0.000	0.000	0.230	0.818	0.000	0.000
Distance	0.000	0.000	-2.710	0.007	-0.001	0.000
ACC	0.045	0.030	1.520	0.128	-0.013	0.103
Big10	0.003	0.029	0.090	0.932	-0.055	0.060
Big12	0.041	0.026	1.540	0.123	-0.011	0.093
SEC	0.040	0.028	1.470	0.142	-0.013	0.094
Tier 2	0.027	0.027	0.970	0.334	-0.027	0.080
Tier3	0.057	0.025	2.300	0.021	0.009	0.106
Constant	0.491	0.044	11.070	0.000	0.404	0.578
sigmau	0.050					
sigmae	0.047					
Rho	0.536	(fraction of variance due to ui)				

Table 18. Forecast Error Variance Decomposition Major Conferences Ordering of Football, Basketball, Other Sports, and Contributions

Variables	Step	Football Win %	Basketball Win %	Other Sports Win %	Contributions
Football Win %	0	1.000	0.000	0.000	0.000
Basketball Win %	0	0.001	0.999	0.000	0.000
Other Sports Win %	0	0.006	0.046	0.949	0.000
Contributions	0	0.543	0.060	0.174	0.223
Football Win %	1	0.692	0.004	0.093	0.212
Basketball Win %	1	0.011	0.925	0.053	0.011
Other Sports Win %	1	0.048	0.038	0.910	0.004
Contributions	1	0.382	0.043	0.300	0.275
Football Win %	4	0.633	0.004	0.161	0.201
Basketball Win %	4	0.012	0.906	0.070	0.012
Other Sports Win %	4	0.057	0.032	0.884	0.027
Contributions	4	0.330	0.037	0.385	0.247
Football Win %	9	0.629	0.004	0.166	0.200
Basketball Win %	9	0.012	0.904	0.071	0.012
Other Sports Win %	9	0.058	0.031	0.883	0.028
Contributions	9	0.327	0.036	0.392	0.245

Table 19. Forecast Error Variance Decomposition Major Conferences Ordering of Football, Other Sports, Basketball, and Contributions

Variables	Step	Football Win %	Other Sports Win %	Basketball Win %	Contributions
Football Win %	0	1.000	0.000	0.000	0.000
Other Sports Win %	0	0.006	0.994	0.000	0.000
Basketball Win %	0	0.001	0.046	0.952	0.000
Contributions	0	0.543	0.126	0.109	0.223
Football Win %	1	0.692	0.081	0.015	0.212
Other Sports Win %	1	0.048	0.947	0.002	0.004
Basketball Win %	1	0.011	0.087	0.891	0.011
Contributions	1	0.382	0.250	0.093	0.275
Football Win %	4	0.633	0.151	0.015	0.201
Other Sports Win %	4	0.057	0.912	0.004	0.027
Basketball Win %	4	0.012	0.103	0.873	0.012
Contributions	4	0.330	0.342	0.080	0.247
Football Win %	9	0.629	0.156	0.015	0.200
Other Sports Win %	9	0.058	0.910	0.004	0.028
Basketball Win %	9	0.012	0.105	0.871	0.012
Contributions	9	0.327	0.349	0.079	0.245

Table 20. Summary Statistics Minor Conferences

Variable	Average	Standard Deviation	Minimum	Maximum	Range
Football Win%	0.46	0.21	0	1	1
Football Bowl Game	0.17	0.37	0	1	1
Football Bowl Win	0.09	0.28	0	1	1
Basketball Win %	0.49	0.18	0.03	0.92	0.92
Basketball NCAA Tournament	0.13	0.33	0.00	1.00	1.00
Other Sports Win %	0.47	0.09	0.20	0.68	0.48
Enrollment in Thousands	19	11	1	58	57
Contributions in Thousands	1,990	2,704	16	22,752	22,735
Right Licensing in Thousands	2,335	3,229	116	21,094	20,978
Coaches' Salaries in Thousands	5,540	3,703	490	25,327	24,837
GDP in Billions	30,388	43,037	12,277	144,180	131,903
Distance in Miles	80	69	0	312	312

1) Current year's dollars.

Table 21. Contributions to Athletic Departments Minor Conferences

Random -effects GLS regression	Number of obs =	798
Group variable: id	Number of groups =	114
R-sq: within = 0.1893	Obs per group: min=	7
between = 0.7774	avg =	7
overall = 0.7134	max =	7
	Wald chi2(21) =	593.27
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.00

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	-55.086	163.178	-0.340	0.736	-374.909	264.737
Bwin	-202.123	184.499	-1.100	0.273	-563.735	159.489
NCAA	403.592	133.757	3.020	0.003	141.432	665.751
Student	-50.194	15.159	-3.310	0.001	-79.904	-20.483
Right Licensing	0.159	0.045	3.530	0.000	0.071	0.247
Salary	0.289	0.033	8.720	0.000	0.224	0.354
GDP	-0.001	0.001	-1.350	0.177	-0.003	0.000
Distance	2.346	1.975	1.190	0.235	-1.525	6.216
BigEast	4383.705	751.340	5.830	0.000	2911.106	5856.303
CUSA	1298.406	578.453	2.240	0.025	164.659	2432.154
MAC	-317.296	450.560	-0.700	0.481	-1200.378	565.786
MWC	933.055	609.378	1.530	0.126	-261.304	2127.415
SunBelt	439.516	436.324	1.010	0.314	-415.664	1294.696
WAC	723.039	480.417	1.510	0.132	-218.561	1664.639
Tier 2	1045.870	402.689	2.600	0.009	256.614	1835.125
Tier3	-630.064	423.418	-1.490	0.137	-1459.947	199.819
Constant	227.989	357.735	0.640	0.524	-473.159	929.138
sigmau	1230.341					
sigmae	1000.951					
Rho	0.602	(fraction of variance due to ui)				

Table 22. P-Value of Differences in Contributions Between Conferences Using Pairwise F-tests

	Big East	CUSA	MAC	MWC	SunBelt	WAC
Big East	--					
CUSA	**0.000**	--				
MAC	**0.000**	**0.011**	--			
MWC	**0.000**	0.623	**0.066**	--		
SunBelt	**0.000**	0.198	0.178	0.476	--	
WAC	**0.000**	0.390	0.073	0.740	0.631	--

Significance at .5% noted by bold numbers

Table 23. Football Winning Percentage Minor Conferences

Random -effects GLS regression	Number of obs =	798
Group variable: id	Number of groups =	114
R-sq: within = 0.251	Obs per group: min=	7
between = 0.2539	avg =	7
overall = 0.1356	max =	7
	Wald chi2(21) =	56.96
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.00

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	0.050	0.026	1.920	0.054	-0.001	0.101
Bwin	-0.014	0.030	-0.480	0.631	-0.073	0.044
NCAA	-0.028	0.021	-1.310	0.191	-0.070	0.014
Student	0.005	0.002	2.840	0.004	0.001	0.008
Right Licensing	0.000	0.000	3.390	0.001	0.000	0.000
Salary	0.000	0.000	-2.340	0.019	0.000	0.000
GDP	0.000	0.000	-0.830	0.409	0.000	0.000
Distance	0.001	0.000	2.850	0.004	0.000	0.001
BigEast	-0.067	0.083	-0.800	0.422	-0.230	0.096
CUSA	-0.069	0.057	-1.200	0.230	-0.181	0.044
MAC	-0.068	0.044	-1.520	0.128	-0.155	0.020
MWC	-0.181	0.065	-2.770	0.006	-0.309	-0.053
SunBelt	-0.137	0.047	-2.890	0.004	-0.230	-0.044
WAC	-0.045	0.049	-0.910	0.361	-0.141	0.051
Tier 2	0.004	0.039	0.110	0.914	-0.073	0.082
Tier3	0.041	0.041	1.000	0.316	-0.039	0.122
Constant	0.386	0.037	10.360	0.000	0.313	0.459
sigmau	0.110					
sigmae	0.166					
Rho	0.303	(fraction of variance due to ui)				

Table 24. Basketball Winning Percentage Minor Conferences

Random -effects GLS regression	Number of obs =	798
Group variable: id	Number of groups =	114
R-sq: within = 0.0041	Obs per group: min=	7
between = 0.3046	avg =	7
overall = 0.1426	max =	7
	Wald chi2(21) =	61.84
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.00

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	0.017	0.021	0.800	0.425	-0.024	0.058
Bwin	-0.004	0.024	-0.180	0.856	-0.052	0.044
NCAA	0.055	0.017	3.230	0.001	0.022	0.088
Student	0.000	0.001	-0.210	0.833	-0.002	0.002
Right Licensing	0.000	0.000	2.640	0.008	0.000	0.000
Salary	0.000	0.000	-0.580	0.563	0.000	0.000
GDP	0.000	0.000	1.110	0.268	0.000	0.000
Distance	0.000	0.000	0.600	0.547	0.000	0.000
BigEast	-0.029	0.058	-0.500	0.618	-0.143	0.085
CUSA	0.097	0.039	2.510	0.012	0.021	0.172
MAC	0.011	0.030	0.380	0.704	-0.047	0.070
MWC	0.060	0.045	1.350	0.178	-0.027	0.148
SunBelt	-0.018	0.032	-0.540	0.588	-0.081	0.046
WAC	0.026	0.033	0.770	0.441	-0.039	0.090
Tier 2	-0.034	0.026	-1.300	0.194	-0.086	0.017
Tier3	-0.022	0.027	-0.800	0.422	-0.076	0.032
Constant	0.457	0.025	17.930	0.000	0.407	0.507
sigmau	0.064					
sigmae	0.131					
Rho	0.193	(fraction of variance due to ui)				

Table 25. Other Sports Winning Percentage Minor Conferences

Random -effects GLS regression	Number of obs =	798
Group variable: id	Number of groups =	114
R-sq: within = 0.0078	Obs per group: min=	7
between = 0.3515	avg =	7
overall = 0.1724	max =	7
	Wald chi2(21) =	41.41
corr(ui, X) = 0 (assumed)	Prob > chi2 =	0.0005

Variable	Coef.	Std. Err.	z	P>z	95% Conf.	Interval
Bowl	-0.01	0.01	-0.58	0.57	-0.03	0.01
Bwin	0.01	0.01	1.00	0.32	-0.01	0.03
NCAA	0.01	0.01	1.38	0.17	0.00	0.03
Student	0.00	0.00	2.74	0.01	0.00	0.00
Right Licensing	0.00	0.00	1.22	0.22	0.00	0.00
Salary	0.00	0.00	0.23	0.82	0.00	0.00
GDP	0.00	0.00	-0.66	0.51	0.00	0.00
Distance	0.00	0.00	2.12	0.03	0.00	0.00
BigEast	0.01	0.04	0.17	0.87	-0.07	0.08
CUSA	0.01	0.03	0.55	0.58	-0.04	0.07
MAC	0.00	0.02	-0.02	0.98	-0.04	0.04
MWC	0.02	0.03	0.62	0.53	-0.04	0.07
SunBelt	0.03	0.02	1.20	0.23	-0.02	0.07
WAC	0.01	0.02	0.53	0.59	-0.03	0.05
Tier 2	0.02	0.02	0.90	0.37	-0.02	0.05
Tier3	0.00	0.02	0.21	0.84	-0.03	0.04
Constant	0.41	0.02	24.59	0.00	0.38	0.44
sigmau	0.053					
sigmae	0.063					
Rho	0.415	(fraction of variance due to ui)				

Table 26. Forecast Error Variance Decomposition Minor Conferences Ordering of Football, Basketball, Other Sports, and Contributions

Variables	Step	Football Win %	Basketball Win %	Other Sports Win %	Contributions
Football Win %	0	1.000	0.000	0.000	0.000
Basketball Win %	0	0.003	0.997	0.000	0.000
Other Sports Win %	0	0.000	0.028	0.972	0.000
Contributions	0	0.081	0.073	0.116	0.731
Football Win %	1	0.924	0.028	0.045	0.004
Basketball Win %	1	0.002	0.753	0.149	0.095
Other Sports Win %	1	0.062	0.017	0.921	0.001
Contributions	1	0.057	0.078	0.079	0.786
Football Win %	4	0.863	0.027	0.106	0.004
Basketball Win %	4	0.039	0.288	0.491	0.183
Other Sports Win %	4	0.088	0.015	0.861	0.037
Contributions	4	0.037	0.108	0.118	0.737
Football Win %	9	0.697	0.026	0.253	0.024
Basketball Win %	9	0.070	0.085	0.689	0.157
Other Sports Win %	9	0.085	0.026	0.788	0.101
Contributions	9	0.055	0.072	0.485	0.387

Table 27. Forecast Error Variance Decomposition Minor Conferences Ordering of Football, Other Sports, Basketball, and Contributions

Variables	Step	Football Win %	Other Sports Win %	Basketball Win %	Contributions
Football Win %	0	1.000	0.000	0.000	0.000
Other Sports Win %	0	0.000	1.000	0.000	0.000
Basketball Win %	0	0.003	0.028	0.969	0.000
Contributions	0	0.081	0.145	0.044	0.731
Football Win %	1	0.924	0.056	0.016	0.004
Other Sports Win %	1	0.062	0.915	0.022	0.001
Basketball Win %	1	0.002	0.129	0.773	0.095
Contributions	1	0.057	0.102	0.054	0.786
Football Win %	4	0.863	0.117	0.017	0.004
Other Sports Win %	4	0.088	0.820	0.055	0.037
Basketball Win %	4	0.039	0.426	0.352	0.183
Contributions	4	0.037	0.113	0.113	0.737
Football Win %	9	0.697	0.247	0.032	0.024
Other Sports Win %	9	0.085	0.724	0.090	0.101
Basketball Win %	9	0.070	0.616	0.157	0.157
Contributions	9	0.055	0.431	0.127	0.387

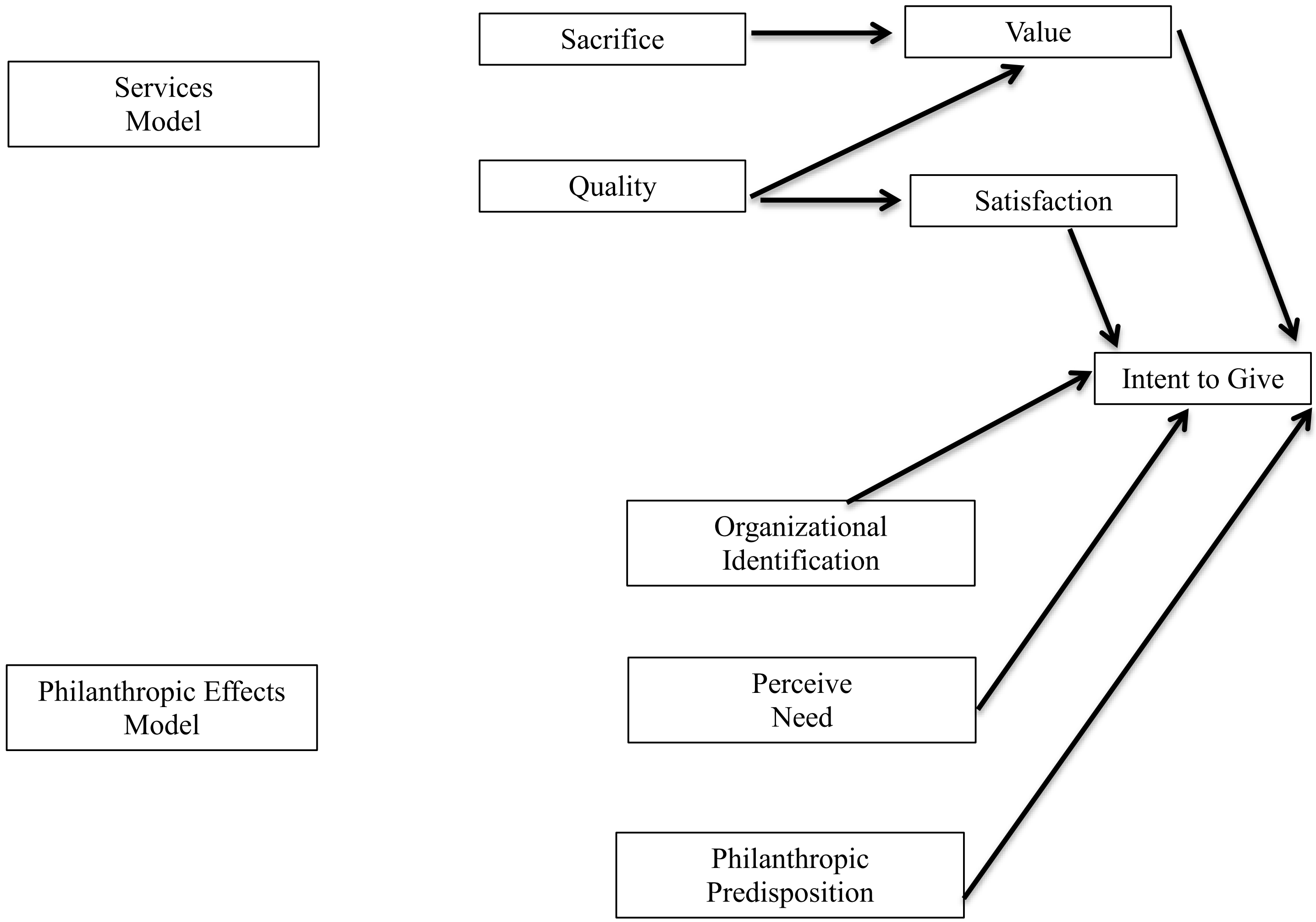


Figure 1. Services-philanthropic giving model (adapted from Brady et al. 2002)

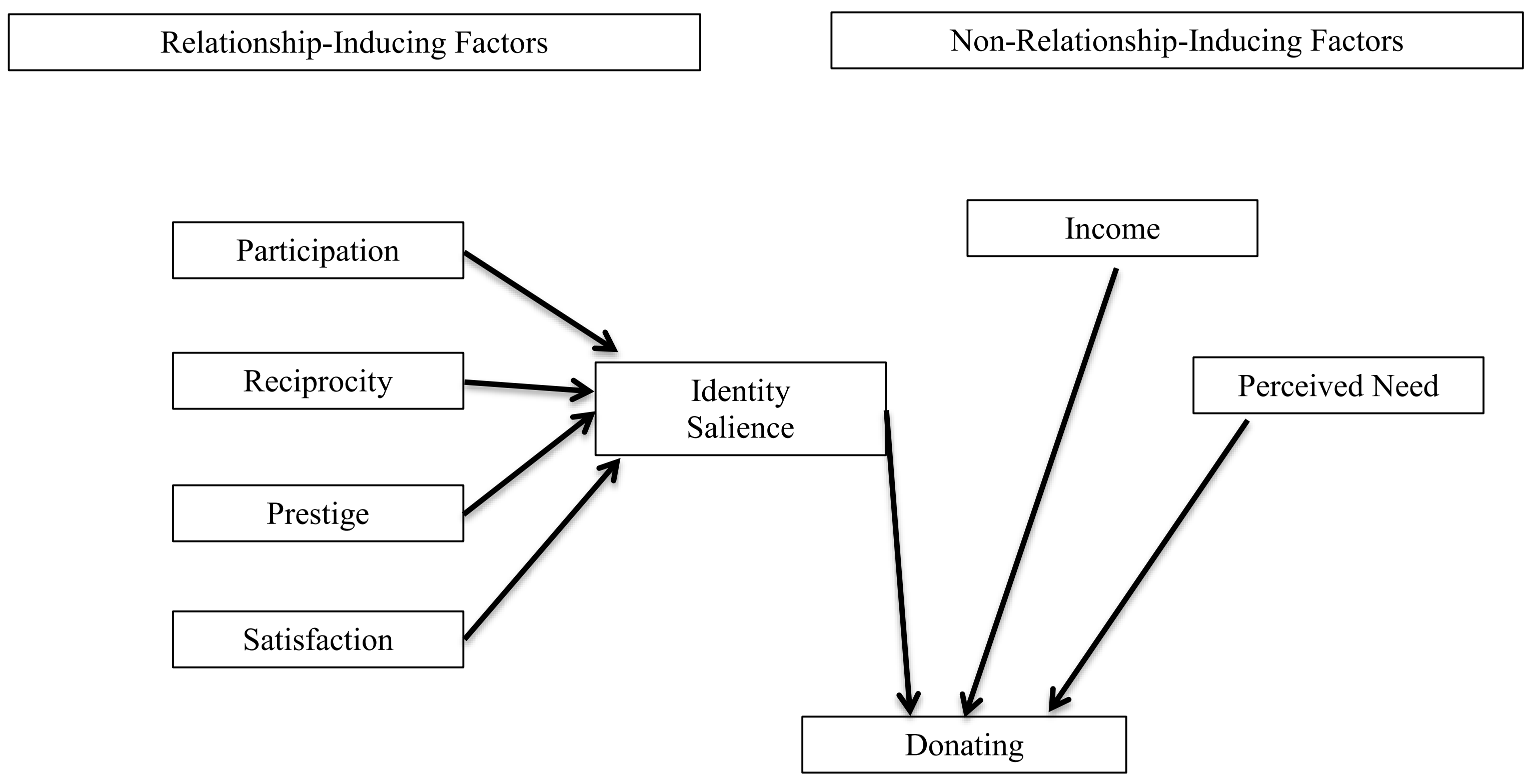


Figure 2. Identity-salience model of relationship marketing success (adapted from Arnett et al. 2003)

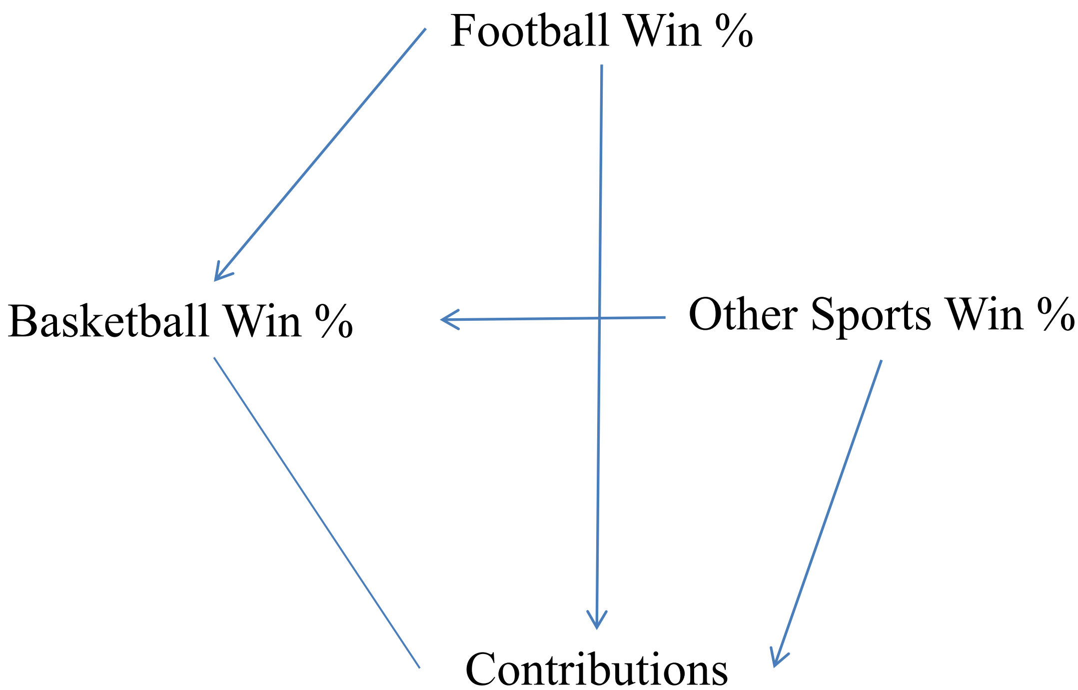


Figure 3. Direct acyclical graph of all conferences system

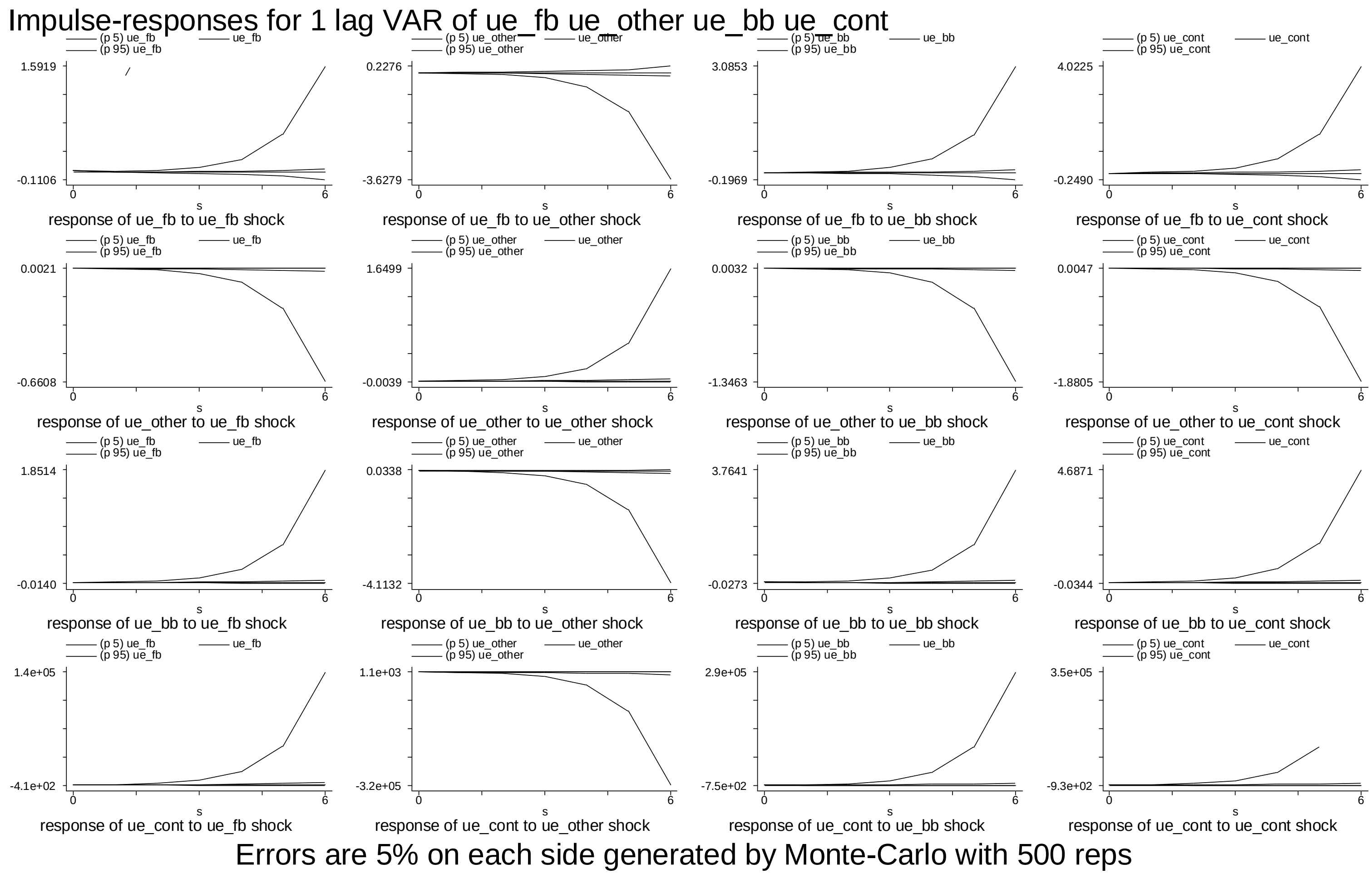


Figure 4. Impulse response function for all conferences system using football, other sports, basketball and contributions ordering. 5 ue and 95 ue represent the confidence interval. Because of inflexibility of graphing within the PVAR program within STATA, further details of these impulse response functions can be found in Appendix B.

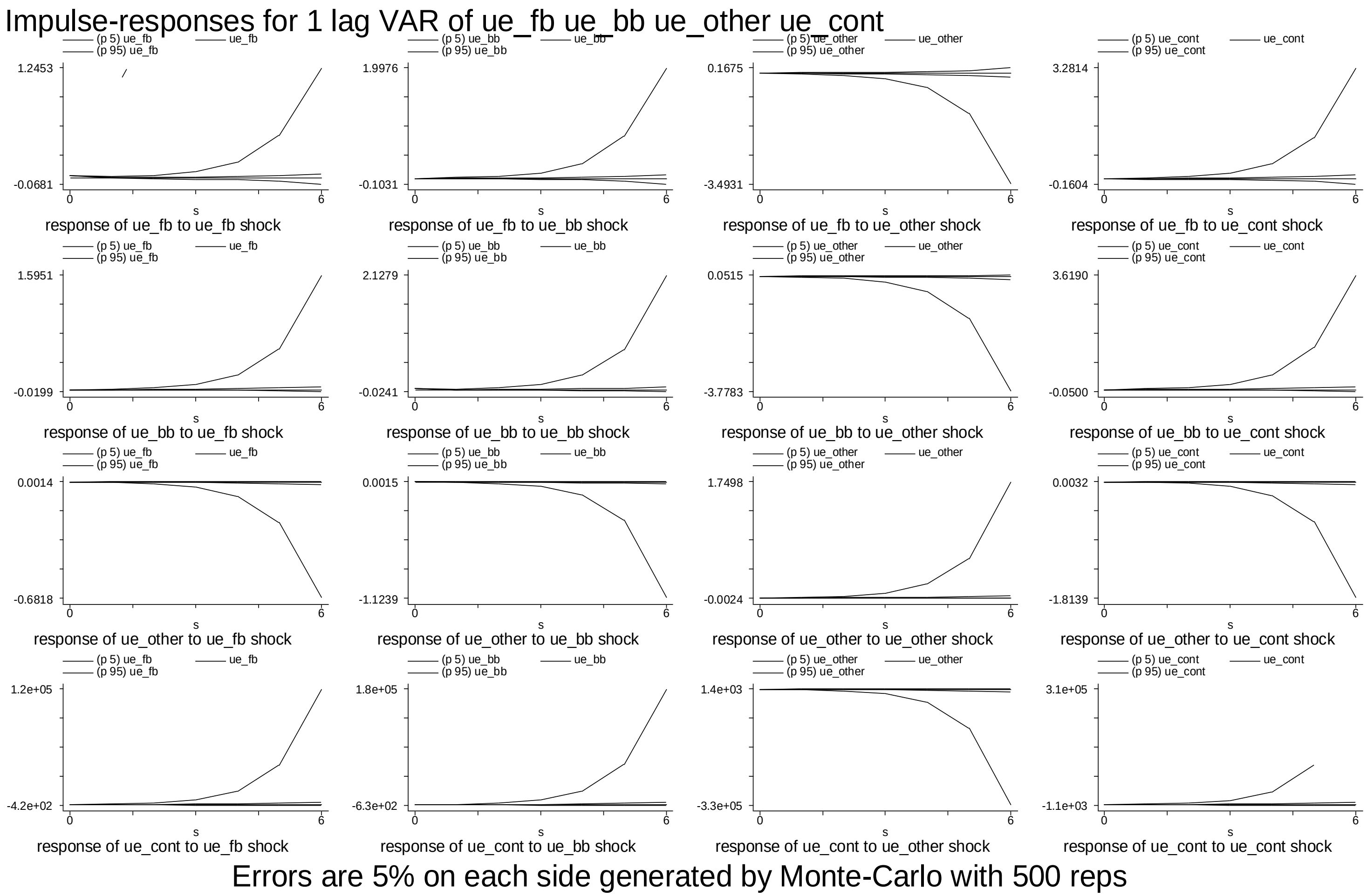


Figure 5. Impulse response function for all conferences system using football, basketball, other sports, and contributions ordering. 5 ue and 95 ue represent the confidence interval. Because of inflexibility of graphing within the PVAR program within STATA, further details of these impulse response functions can be found in Appendix B.

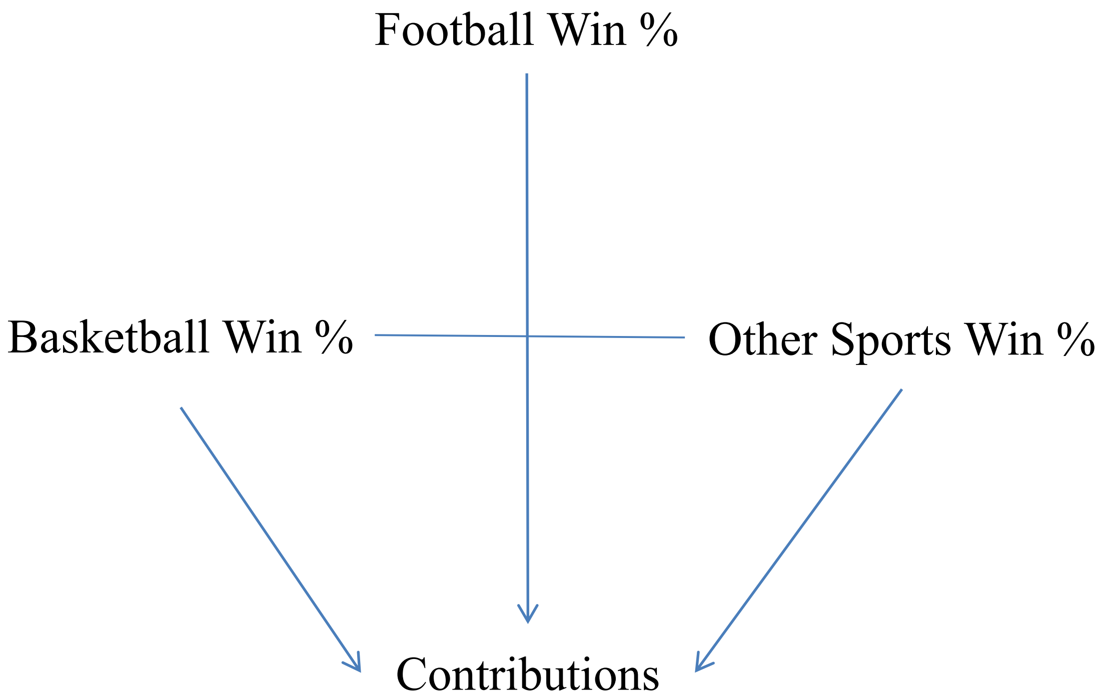


Figure 6. Direct acyclical graph of major conferences system.

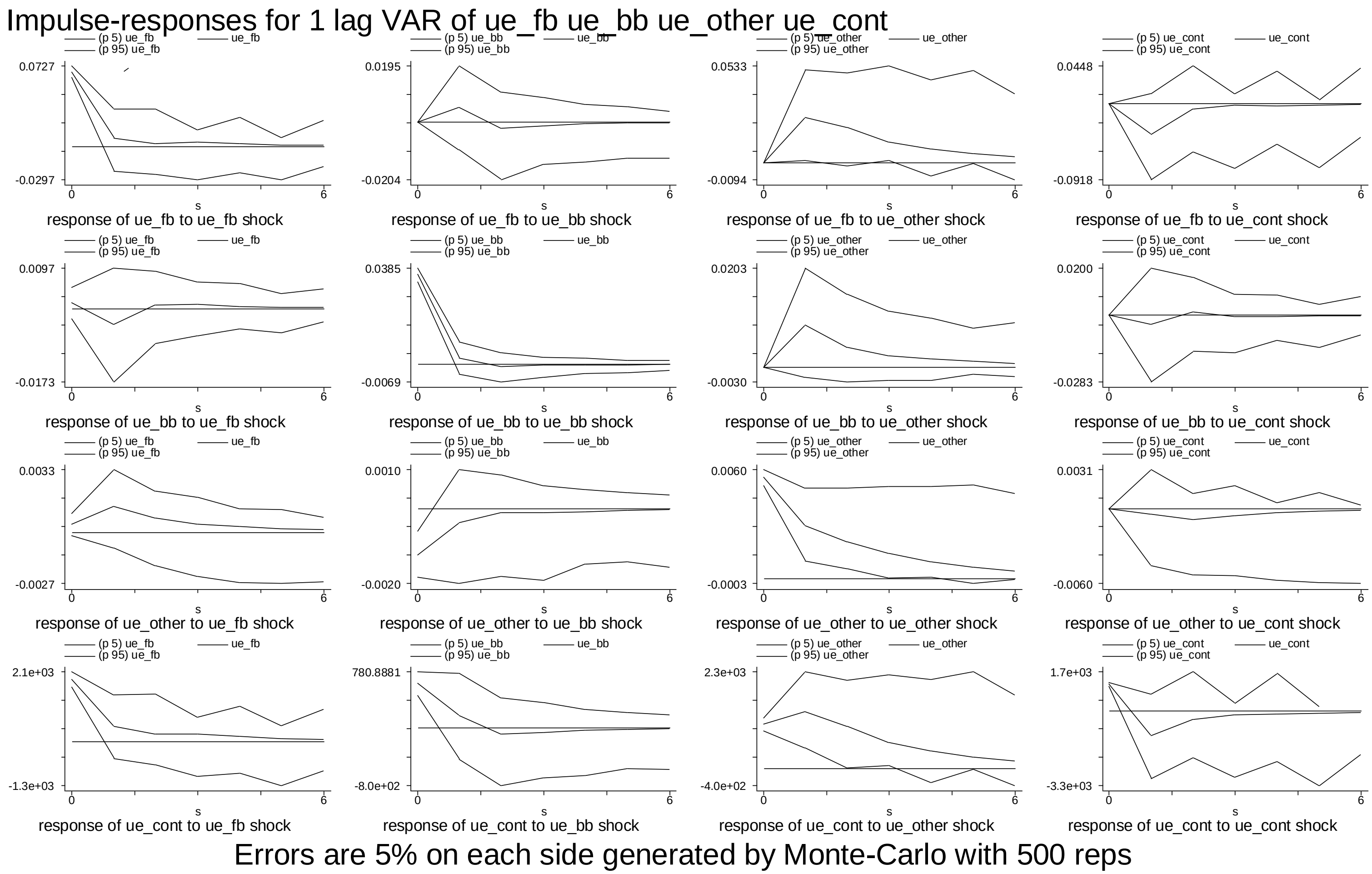


Figure 7. Impulse response function for major conferences system using football, basketball other sports, and contributions ordering. 5 ue and 95 ue represent the confidence interval.

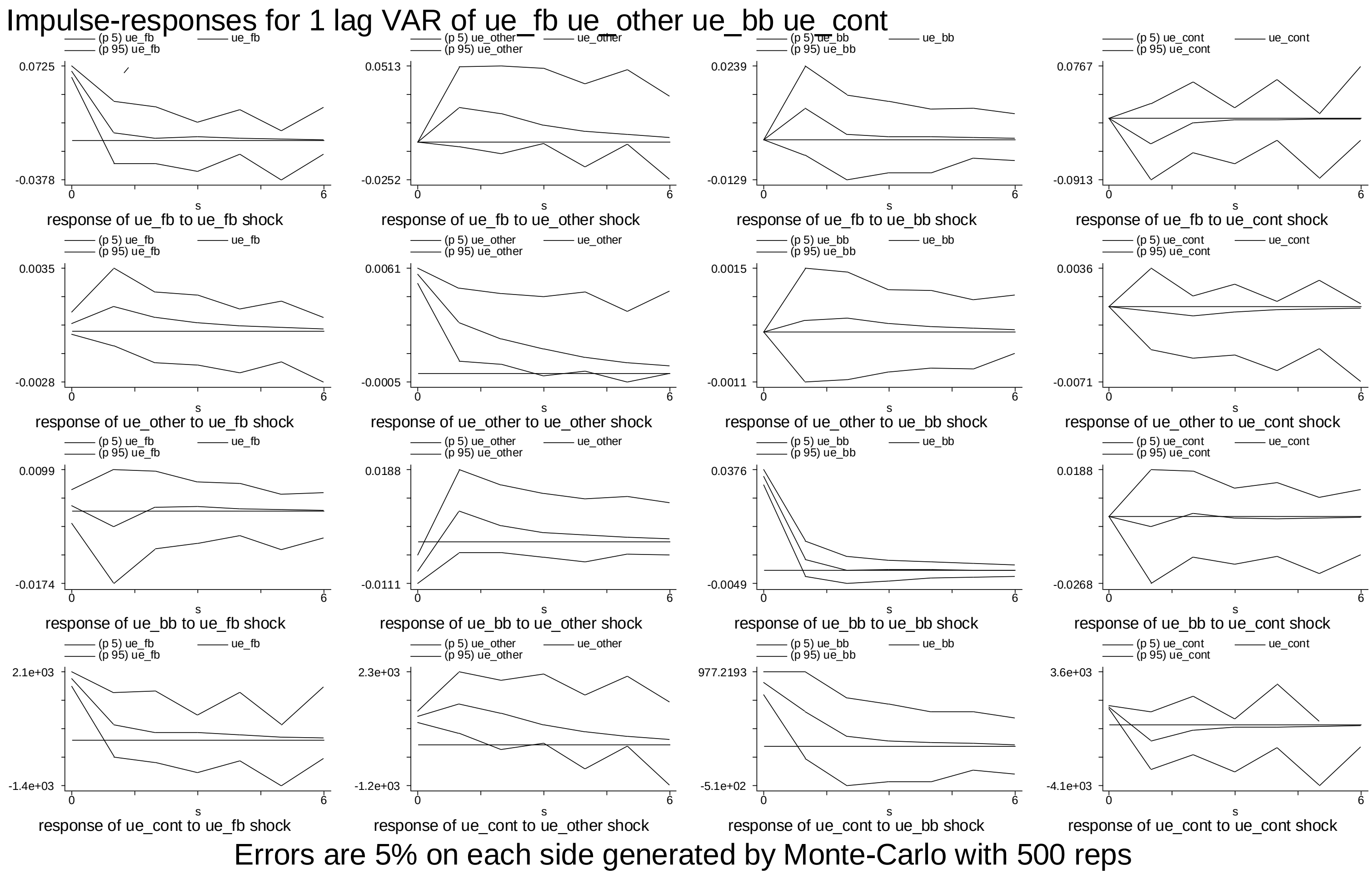


Figure 8. Impulse response function for major conferences system using football, other sports, basketball and contributions ordering. 5 ue and 95 ue represent the confidence interval.

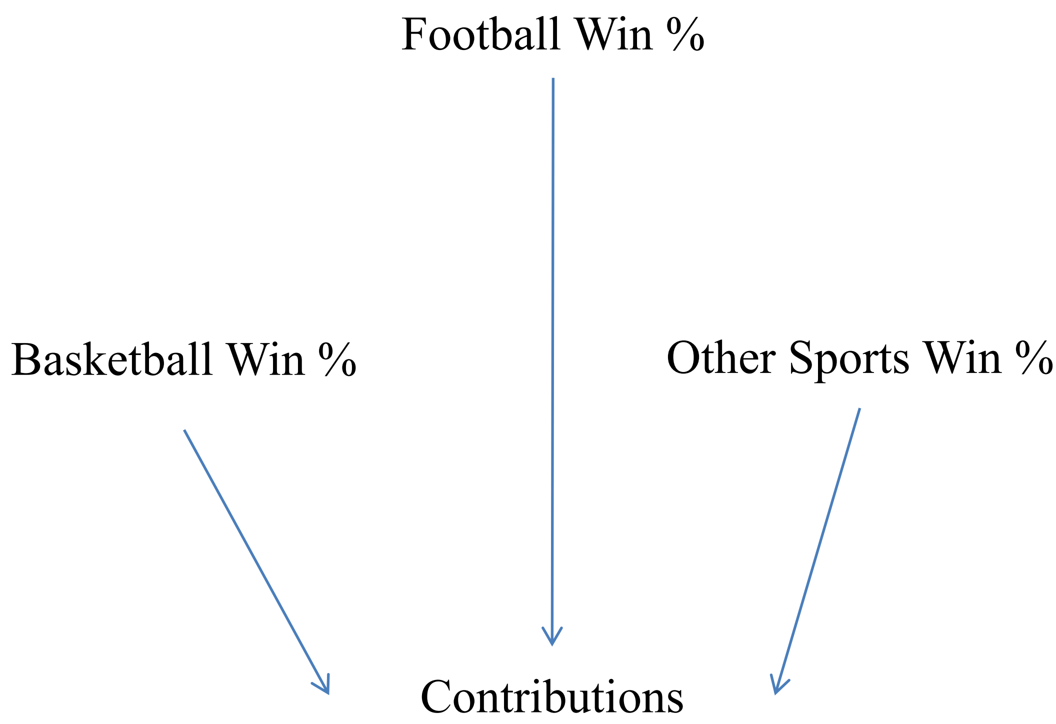


Figure 9. Direct acyclical graph of minor conferences system

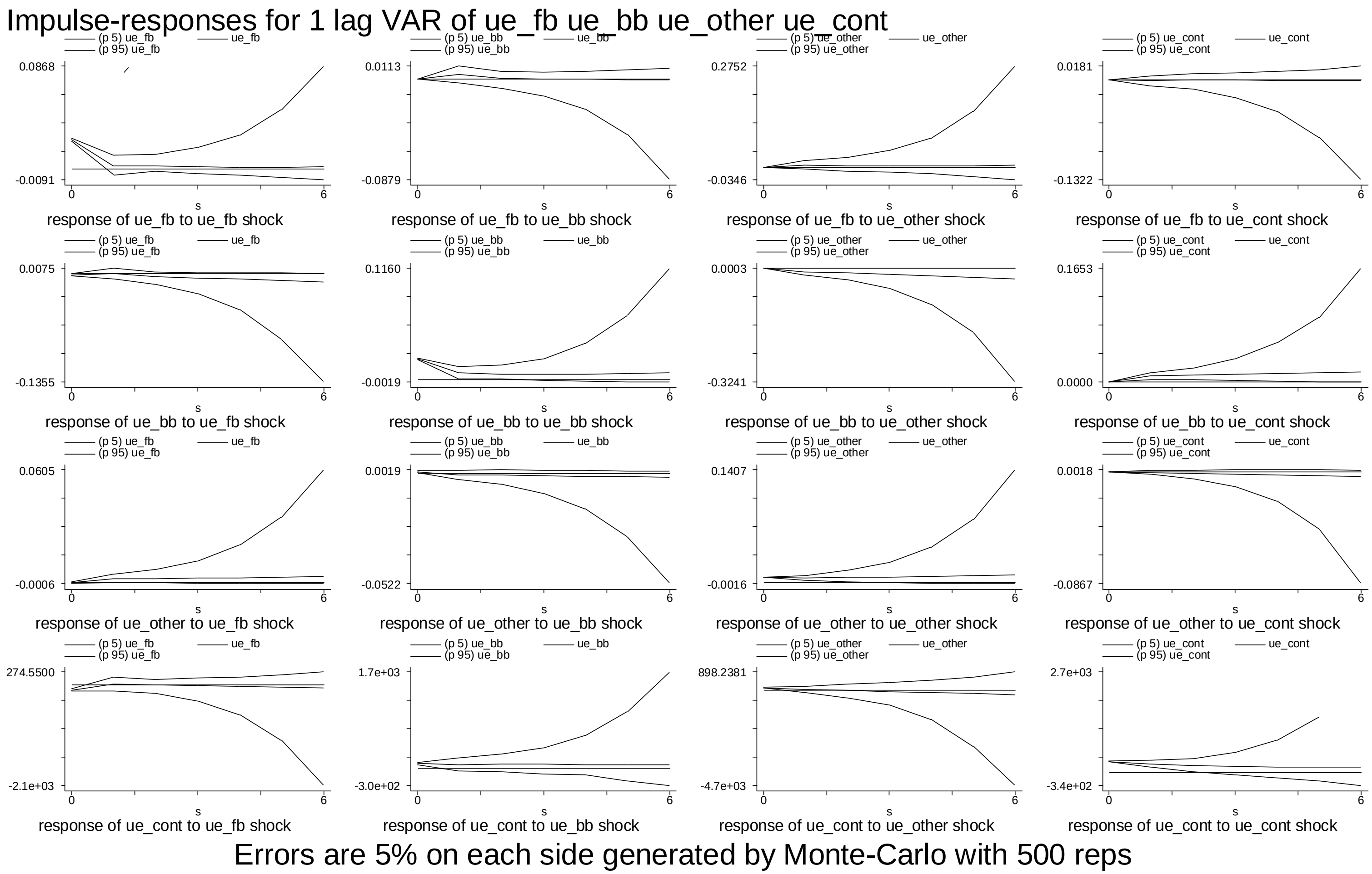


Figure 10. Impulse response function for minor conferences system using football, basketball, other sports, and contributions ordering. 5 ue and 95 ue represent the confidence interval. Because of inflexibility of graphing within the PVAR program within STATA, further details of these impulse response functions can be found in Appendix B.

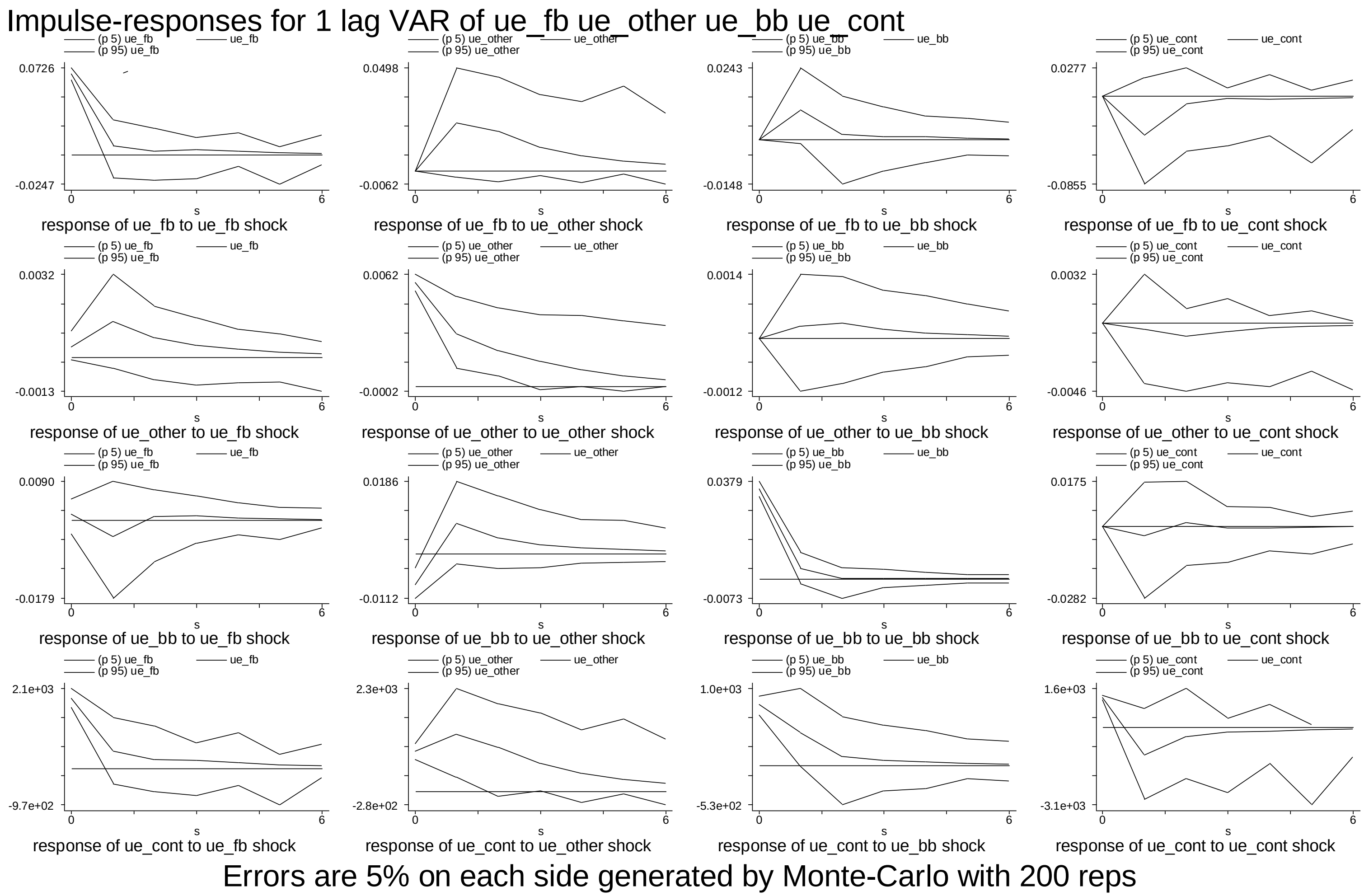


Figure 11. Impulse response function for minor conferences system using football, other sports, basketball and contributions ordering. 5 ue and 95 ue represent the confidence interval.

APPENDIX B

Impulse response functions (Figures 4, 5, and 10) depict the graphing of the PVAR program within STATA. These graphs below limit the number of years plotted by the graphs to provide a clearer visual for the reader to help understand the impacts of athletics on contributions. Figures B.1, B.2, and B.3 correspond to the contemporaneous structures provided in figures 4, 5, 10. The 5% and 95% confidence intervals along with the expected responses are provided through football (ue_fb), basketball (ue_bb), other sports (ue_os), and contributions (ue_cont).

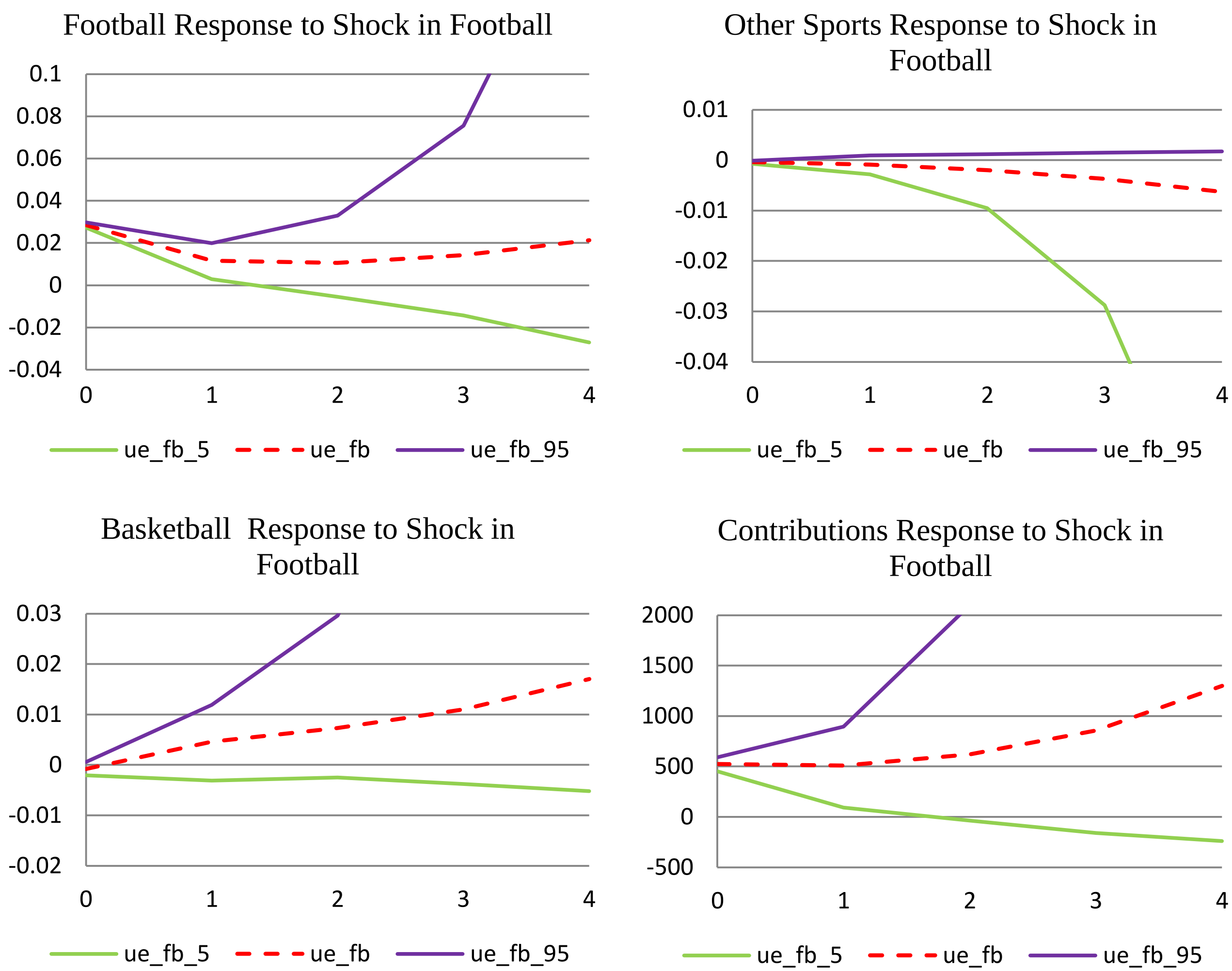
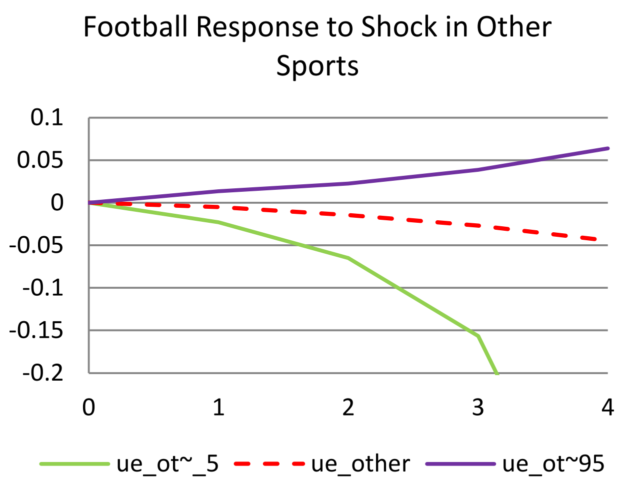
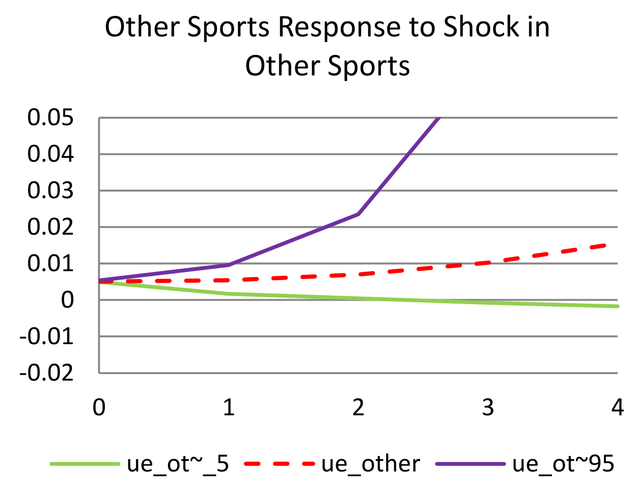
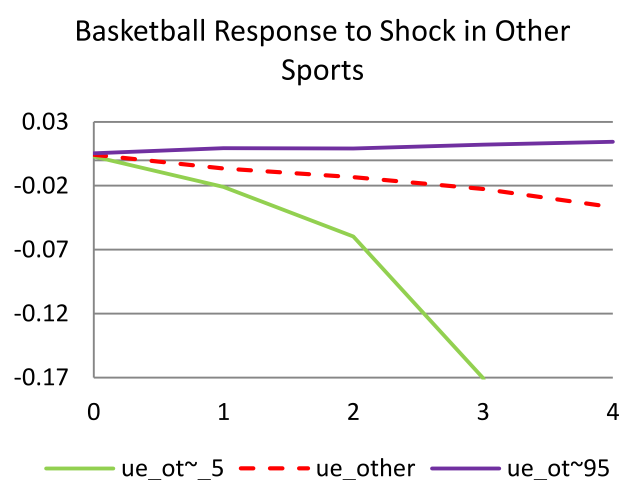
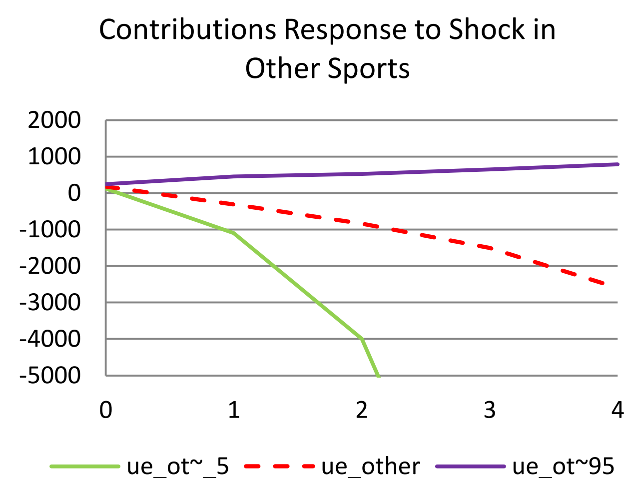


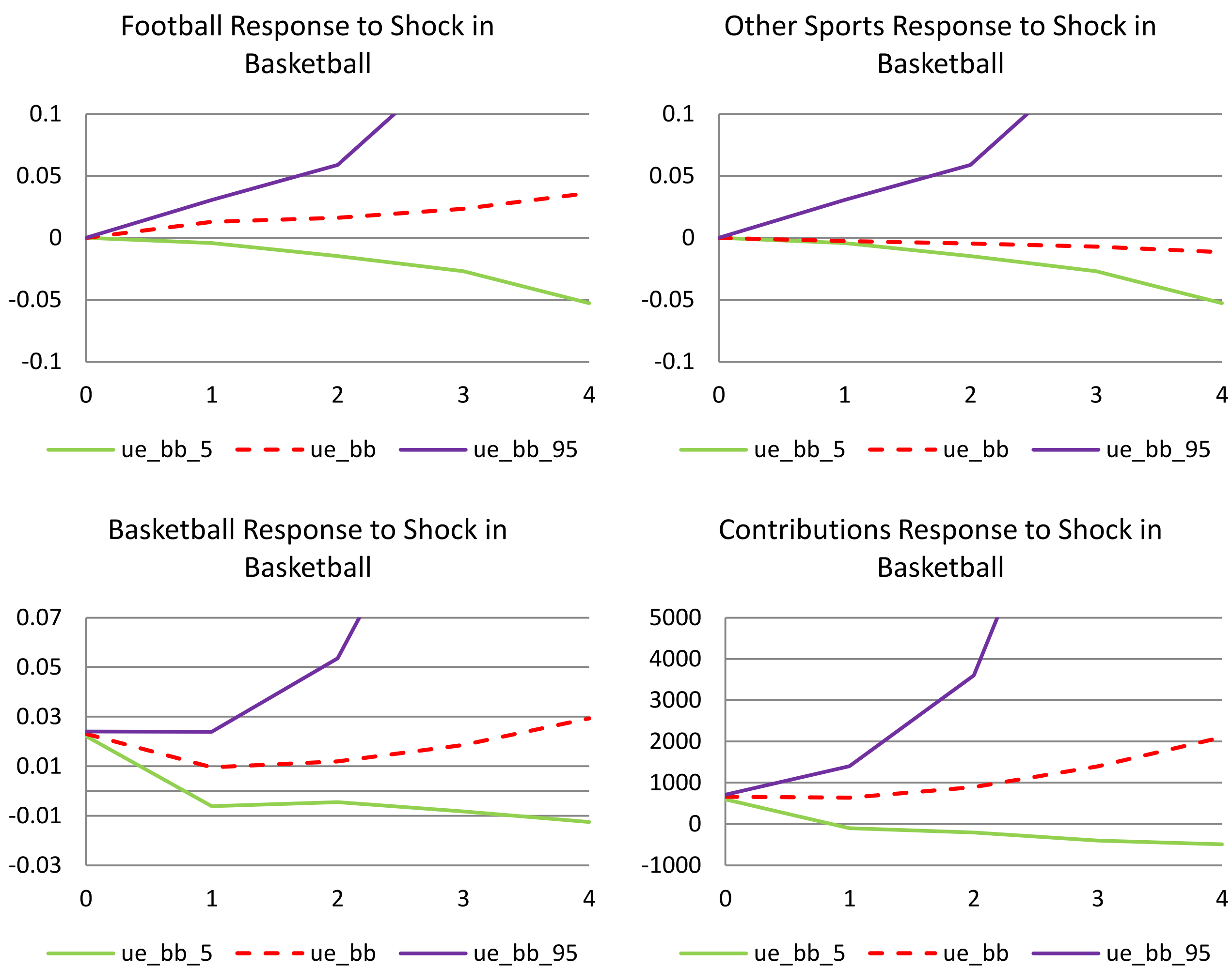
Figure B.1..Impulse response function for all conferences system using football, other sports, basketball and contributions ordering


Football Response to Shock in Other Sports
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95

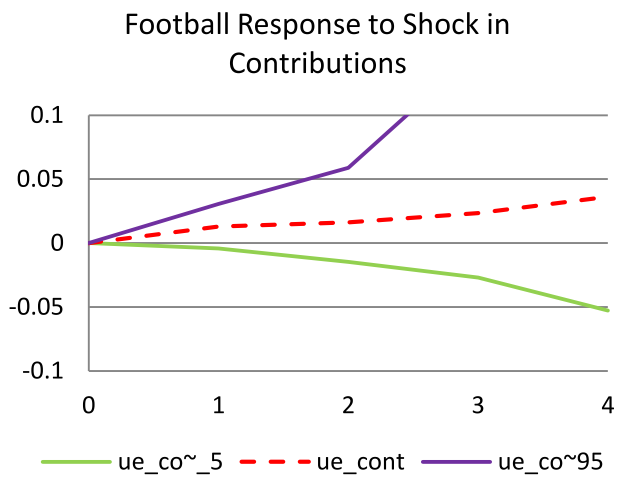

Other Sports Response to Shock in Other Sports
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95

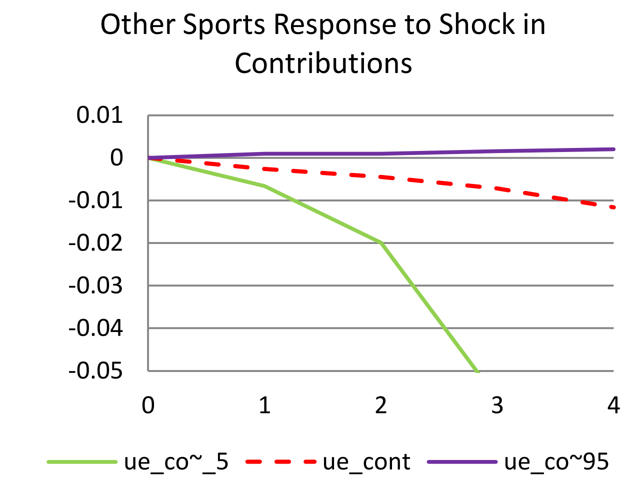

Basketball Response to Shock in Other Sports
0.03
-0.02
-0.07
-0.12
-0.17
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95

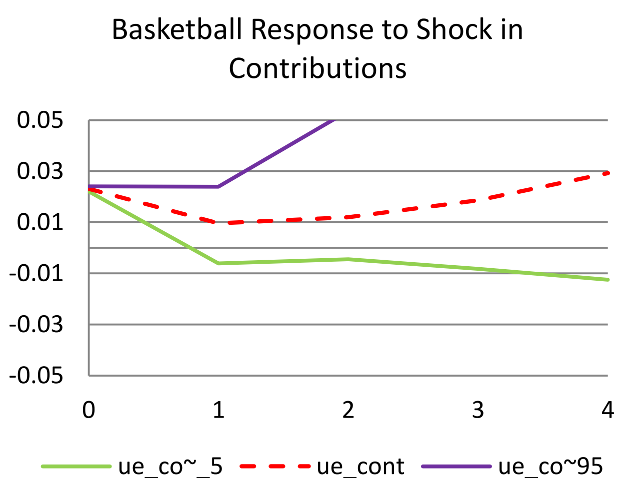

Contributions Response to Shock in Other Sports
2000
1000
0
-1000
-2000
-3000
-4000
-5000
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95

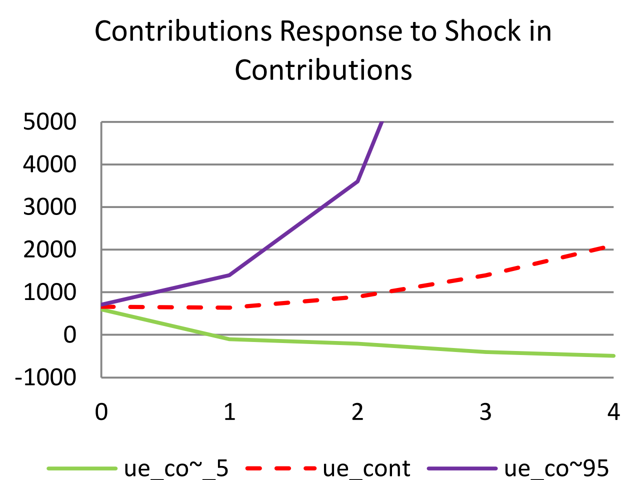


Football Response to Shock in Basketball
0.1
0.05
0
-0.05
-0.1
0
1
2
3
4
ue_bb_5
ue_bb
ue_bb_95
Other Sports Response to Shock in Basketball
0.1
0.05
0
-0.05
-0.1
0
1
2
3
4
ue_bb_5
ue_bb
ue_bb_95
Basketball Response to Shock in Basketball
0.07
0.05
0.03
0.01
-0.01
-0.03
0
1
2
3
4
ue_bb_5
ue_bb
ue_bb_95
Contributions Response to Shock in Basketball
5000
4000
3000
2000
1000
0
-1000
0
1
2
3
4
ue_bb_5
ue_bb
ue_bb_95


Football Response to Shock in Contributions
0.1
0.05
0
-0.05
-0.1
0 1 2 3 4
ue_co~_5
ue_cont
ue_co~95


Other Sports Response to Shock in Contributions
0.01
0
-0.01
-0.02
-0.03
-0.04
-0.05
0 1 2 3 4
ue_co~_5
ue_cont
ue_co~95


Basketball Response to Shock in Contributions
0.05
0.03
0.01
-0.01
-0.03
-0.05
0 1 2 3 4
ue_co~_5
ue_cont
ue_co~95


Contributions Response to Shock in Contributions
5000
4000
3000
2000
1000
0
-1000
0 1 2 3 4
ue_co~_5
ue_cont
ue_co~95

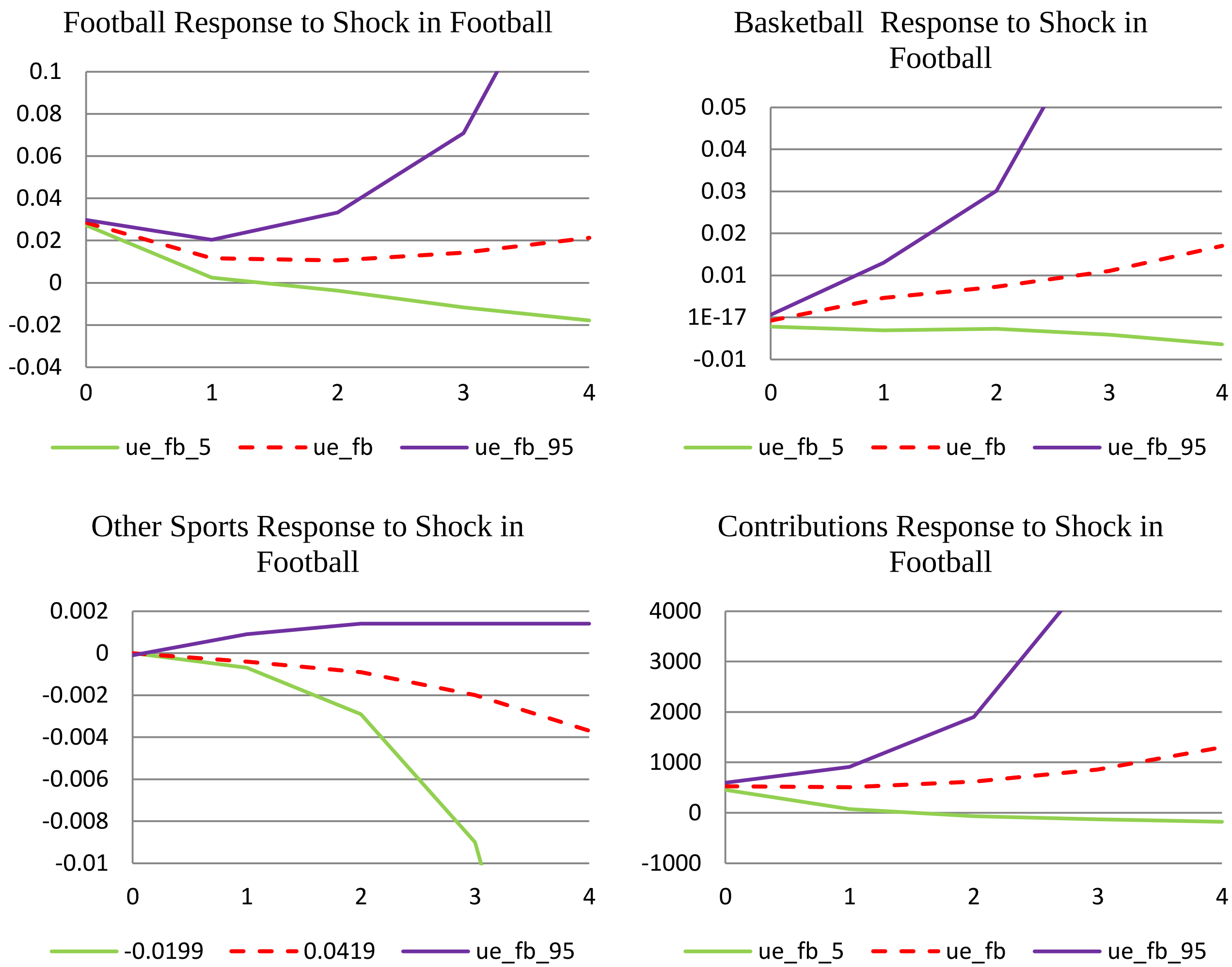
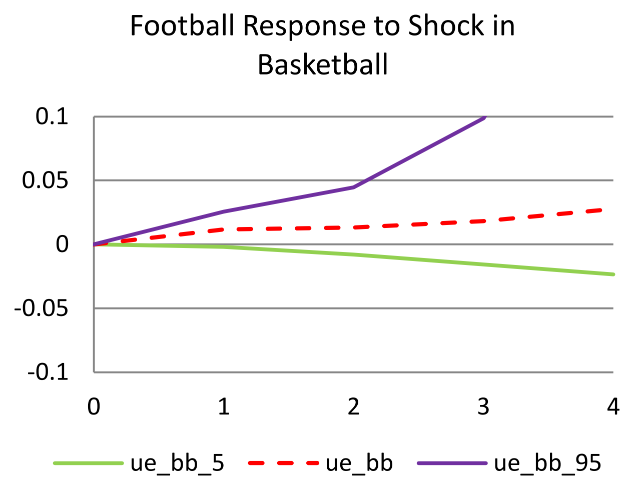
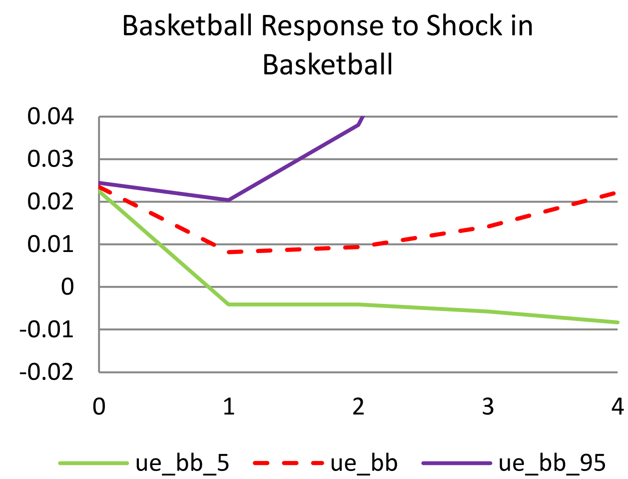
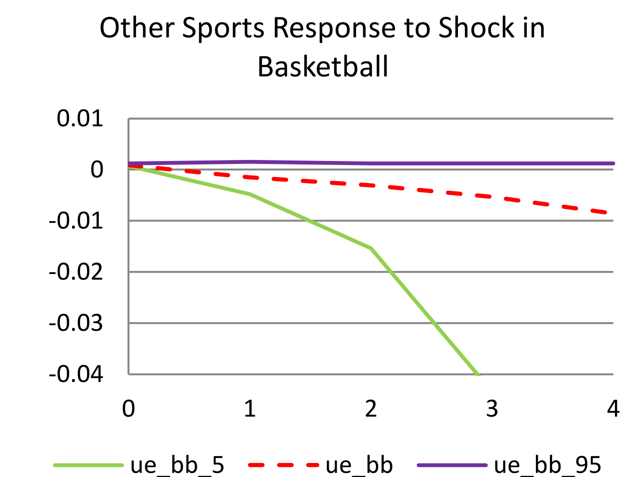
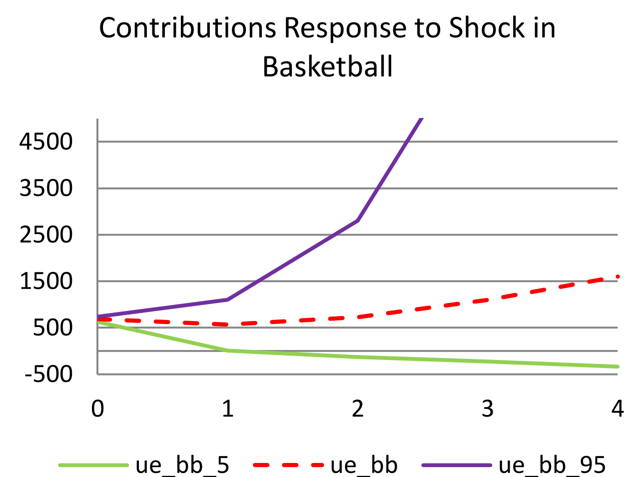


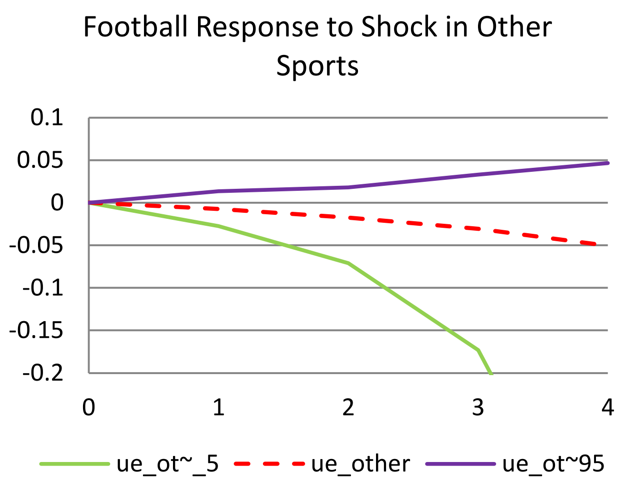
Figure B.2. Impulse response function for all conferences system using football, basketball, other sports, and contributions ordering. 5 ue and 95 ue represent the confidence interval.

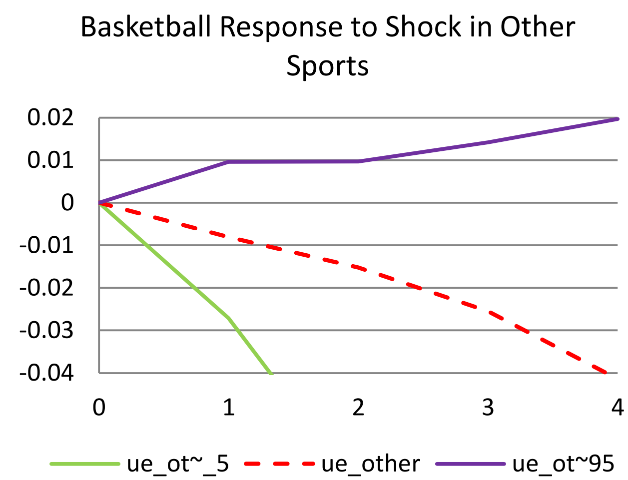

Football Response to Shock in Basketball
0.1
0.05
0
-0.05
-0.1
0 1 2 3 4
ue_bb_5
ue_bb
ue_bb_95

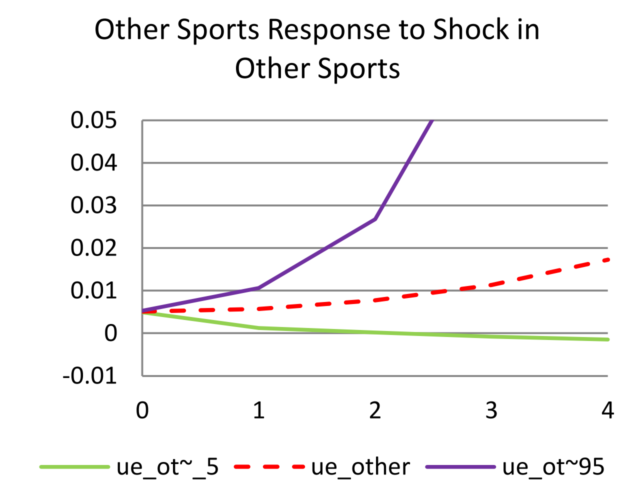

Basketball Response to Shock in Basketball
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0 1 2 3 4
ue_bb_5
ue_bb
ue_bb_95

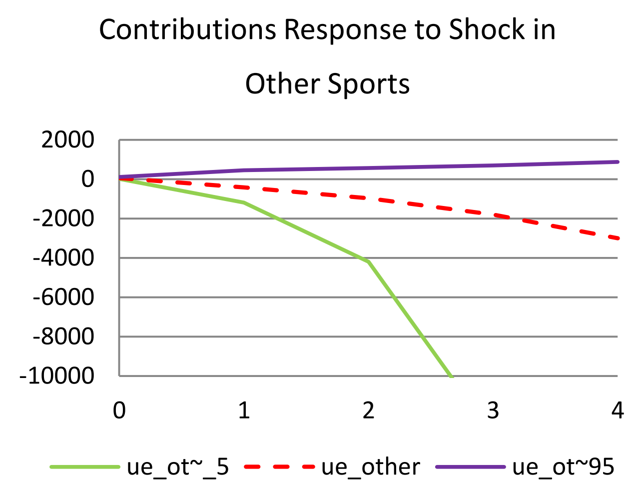

Other Sports Response to Shock in Basketball
0.01
0
-0.01
-0.02
-0.03
-0.04
0 1 2 3 4
ue_bb_5
ue_bb
ue_bb_95

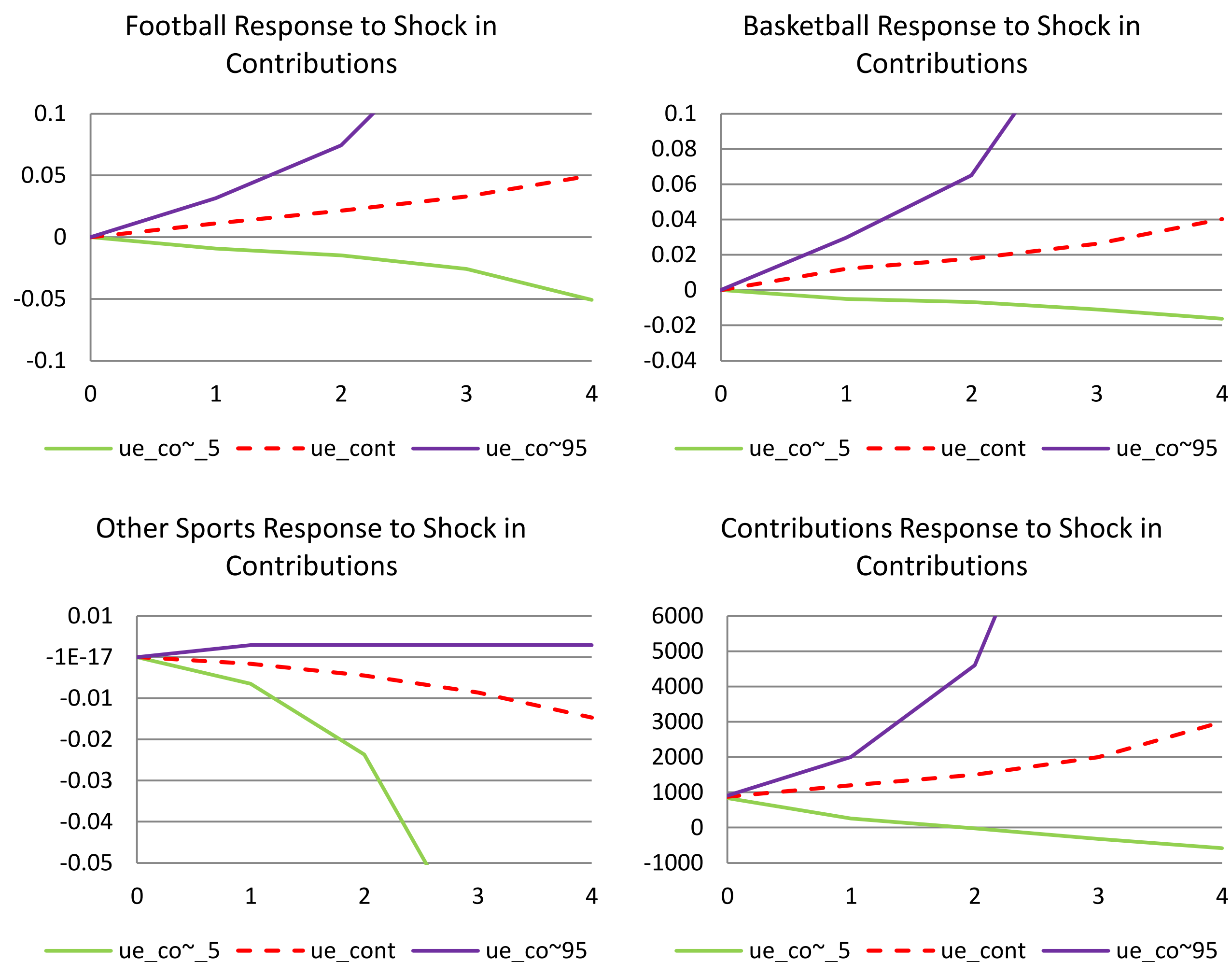

Contributions Response to Shock in Basketball
4500
3500
2500
1500
500
-500
0 1 2 3 4
ue_bb_5
ue_bb
ue_bb_95


Football Response to Shock in Other Sports
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95


Basketball Response to Shock in Other Sports
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95


Other Sports Response to Shock in Other Sports
0.05
0.04
0.03
0.02
0.01
0
-0.01
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95


Contributions Response to Shock in Other Sports
2000
0
-2000
-4000
-6000
-8000
-10000
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95



Football Response to Shock in Contributions
0.1
0.05
0
-0.05
-0.1
0
1
2
3
4
ue_co~_5
ue_cont
ue_co~95
Basketball Response to Shock in Contributions
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
0
1
2
3
4
ue_co~_5
ue_cont
ue_co~95
Other Sports Response to Shock in Contributions
0.01
-1E-17
-0.01
-0.02
-0.03
-0.04
-0.05
0
1
2
3
4
ue_co~_5
ue_cont
ue_co~95
Contributions Response to Shock in Contributions
6000
5000
4000
3000
2000
1000
0
-1000
0
1
2
3
4
ue_co~_5
ue_cont
ue_co~95

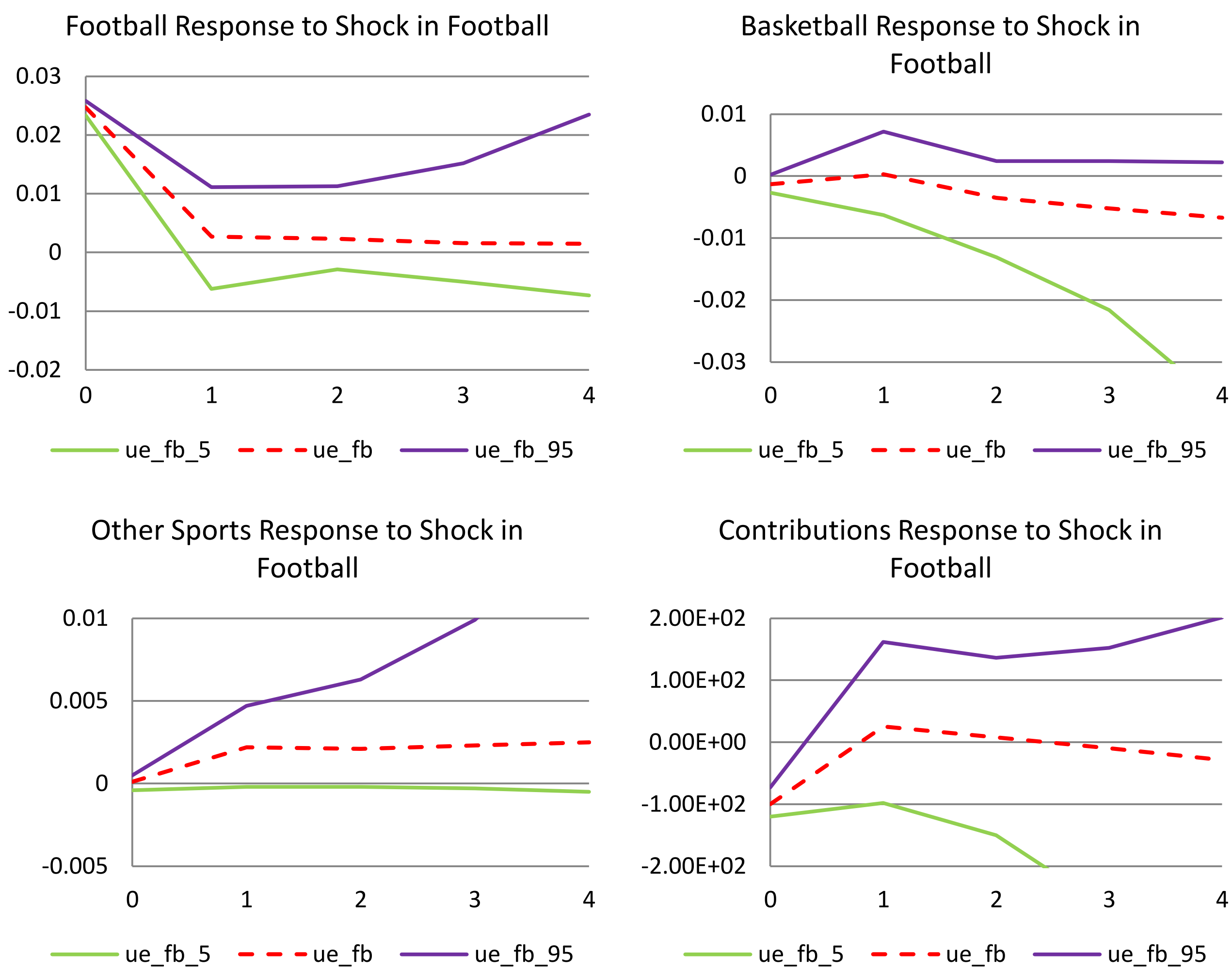
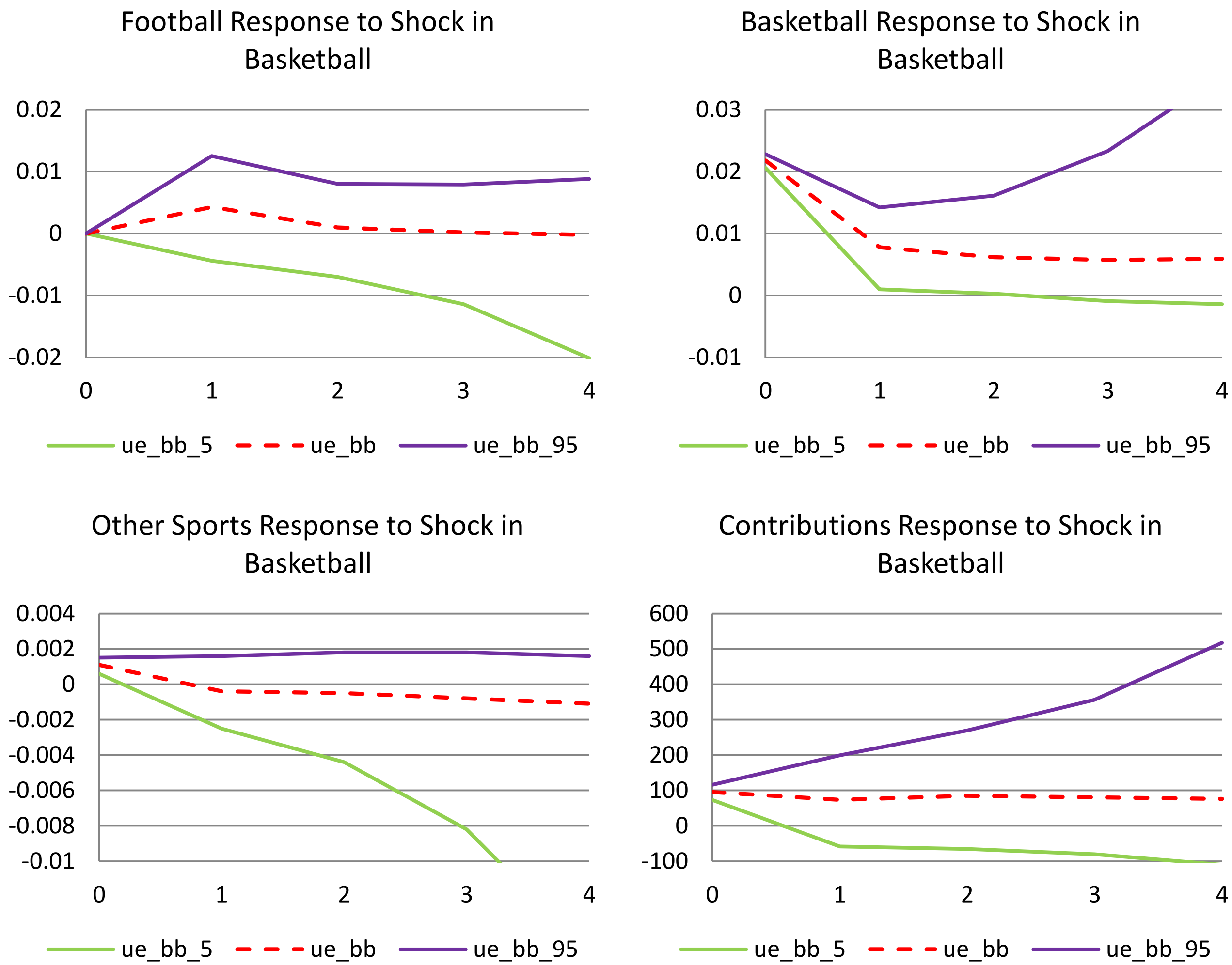
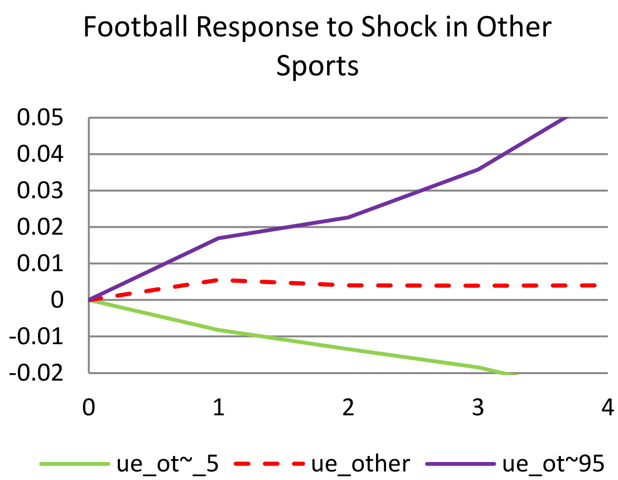
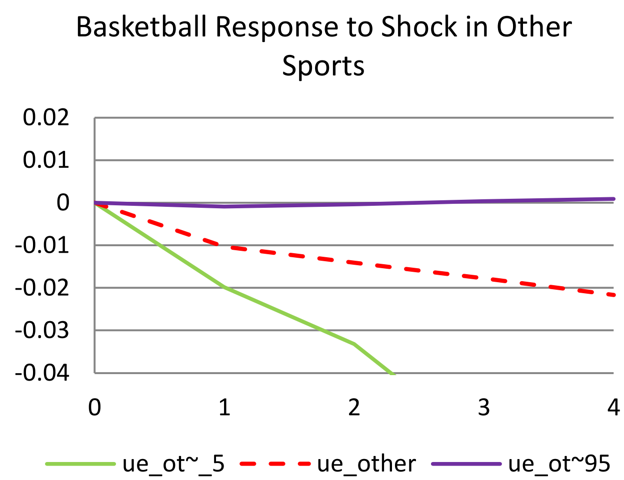
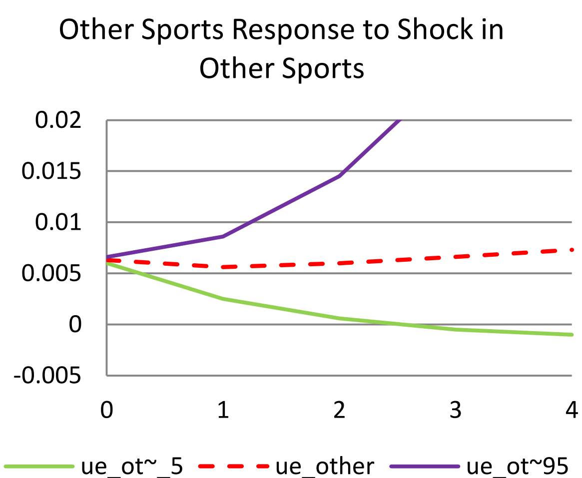


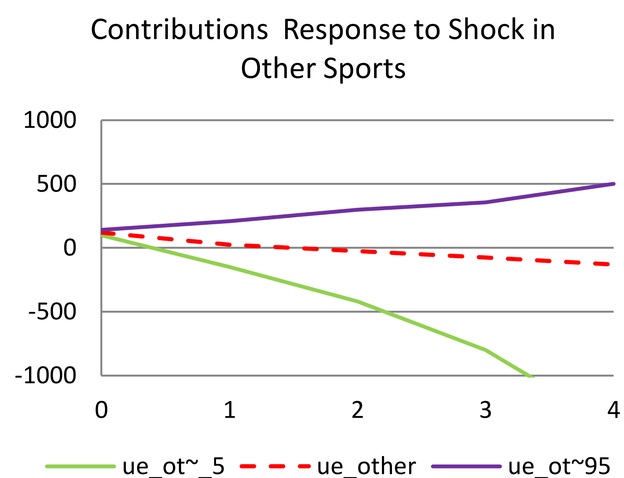
Figure B.3. Impulse response function for minor conferences system using football, basketball, other sports, and contributions ordering. 5 ue and 95 ue represent the confidence interval.

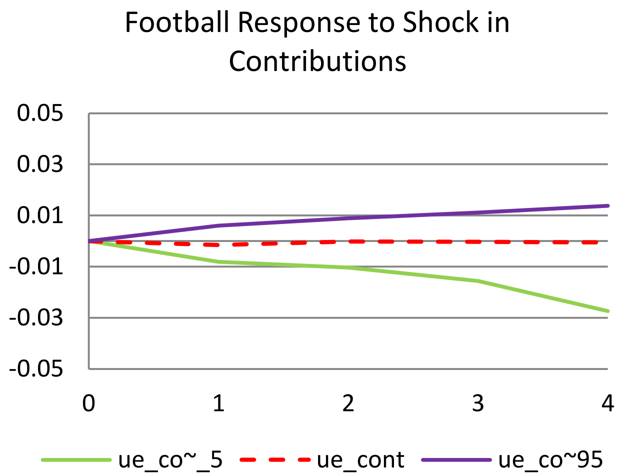

Football Response to Shock in Basketball
0.02
0.01
0
-0.01
-0.02
0
1
2
3
4
ue_bb_5
ue_bb
ue_bb_95
Basketball Response to Shock in Basketball
0.03
0.02
0.01
0
-0.01
0
1
2
3
4
ue_bb_5
ue_bb
ue_bb_95
Other Sports Response to Shock in Basketball
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
0
1
2
3
4
ue_bb_5
ue_bb
ue_bb_95
Contributions Response to Shock in Basketball
600
500
400
300
200
100
0
-100
0
1
2
3
4
ue_bb_5
ue_bb
ue_bb_95

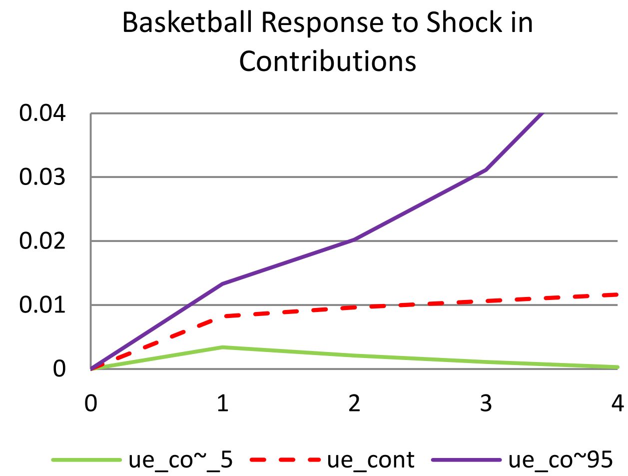

Football Response to Shock in Other Sports
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95

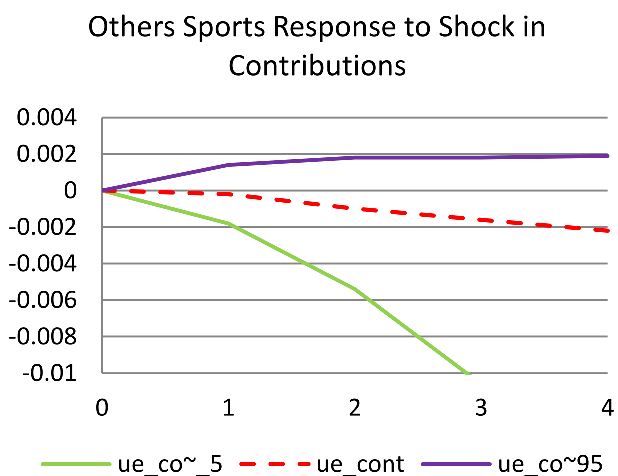

Basketball Response to Shock in Other Sports
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95

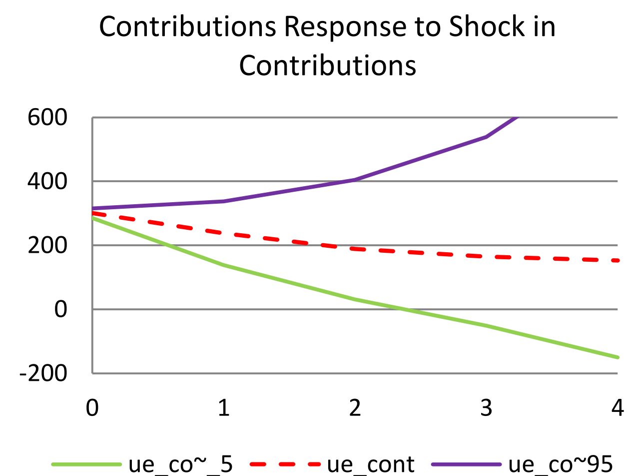

Other Sports Response to Shock in Other Sports
0.02
0.015
0.01
0.005
0
-0.005
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95


Contributions Response to Shock in Other Sports
1000
500
0
-500
-1000
0
1
2
3
4
ue_ot~_5
ue_other
ue_ot~95


Football Response to Shock in Contributions
0.05
0.03
0.01
-0.01
-0.03
-0.05
0 1 2 3 4
ue_co~_5
ue_cont
ue_co~95


Basketball Response to Shock in Contributions
0.04
0.03
0.02
0.01
0
0 1 2 3 4
ue_co~_5
ue_cont
ue_co~95


Others Sports Response to Shock in Contributions
0.004
0.002
0
-0.002
-0.004
-0.006
-0.008
-0.01
0 1 2 3 4
ue_co~_5
ue_cont
ue_co~95


Contributions Response to Shock in Contributions
600
400
200
0
-200
0 1 2 3 4
ue_co~_5
ue_cont
ue_co~95